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DAAK80-79-C-0258

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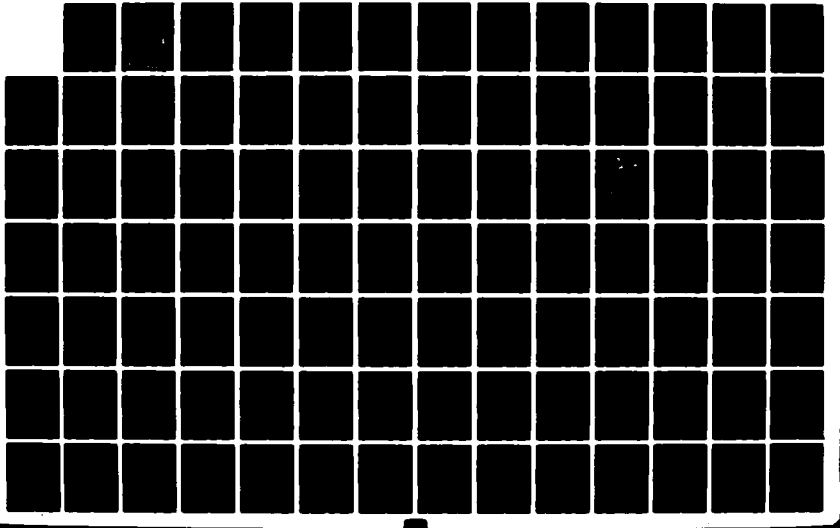

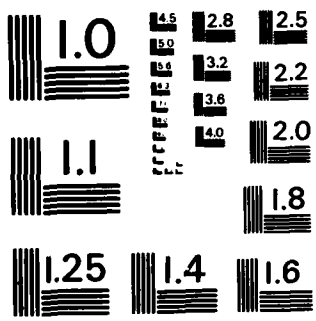

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ADDENDUM TO THE

MIL-STD-1553

MULTIPLEX APPLICATIONS HANDBOOK

CHAPTER 11

MARCH 1983

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MIL-STD-1553, INTERFACE, CODING

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This document contains data words and message formats to be used for MIL-STD-1553 data bus applications. This document is intended as a guide for military & private sector designers to identify standard data words and messages for use in future avionics systems and subsystems. This report is to be Chapter 11 in the existing MIL-STD-1553 Multiplex Applications Handbook which the Defense Material Standards and Specifications Office (DMSSO) plans for publication as a Military Handbook on MIL-STD-1553.

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ADDENDUM TO THE
MIL-STD-1553
MULTIPLEX APPLICATIONS HANDBOOK

CHAPTER 11

MARCH 1983

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11.0 DATA WORD AND MESSAGE FORMAT GUIDELINES

11.1 INTRODUCTION

The emphasis in this chapter is the development of data word and message formats for MIL-STD-1553 data bus applications. This chapter is intended as a guide for the designer to identify standard data words and messages for use in avionic systems and subsystems. These standard words and messages, as well as the documentation format for interface control document (ICD) sheets, provide the basis for defining 1553 systems. Also provided in this chapter is the method for developing additional data word formats and messages that may be required by a particular system but are not covered by the formats provided herein. It is essential that any new word formats or message formats that are developed for a 1553 application follow the fundamental guidelines established in this chapter in order to ease future standardization of these words and messages. The standard word formats presented represent a composite result of studies conducted by the U.S. Army, Navy, and Air Force (see References 1, 2 and 3, respectively).

References

1. MIL-STD-1553 Data Word Standardization Technical Report, STR-DD-81273-1, SEMCOR, September 1981, U.S. Army Avionics R&D Activity, Contract No. DAAK80-79-C-0258

2. AAAS Multiplex Armament Data Word Standardization Study, 4092 TM-81-BASIC -006, SEMCOR, February 1981, Naval Air Development Center, Contract No. N62269-78-C-0302

3. MIL-STD-1553 Multiplex Data Bus Word Format Study, Boeing Military Airplane Company, October 1981, USAF/ASD Contract No. F33615-80-C-0124

In accordance with Public Law 94-168, Metric Conversion Act of 1975, and Department of Defense (DOD) Directive 4120.18, Use of Metric System of Measurement, metric units are preferred for use in new systems. (Reference National Aerospace Standard NAS10001, Preferred Metric Units for Aerospace, which lists the preferred metric units and conversion factors for a number of commonly used quantities in the aerospace industry.) However, when the use of metric units is not practical, the English units presented in this document may be used.

The necessity for standardizing data word and message formats became evident as more and more subsystems provided 1553 interfaces as the basic input and output communication interface. Without coordination of these interfaces, outputs from a subsystem were incompatible with the input requirements of the interfacing subsystem. When new 1553 hardware and systems are designed, the system designer is responsible for identifying the interface requirements of all devices and establishing compatible words and messages for proper communications. Naturally, this is accomplished during the early system development phases and is then reflected in future procurement specifications for the subsystem elements of the design. This method provides an integrated system that meets all the individual communication requirements. However, as more 1553 systems are developed, this approach may result in subsystems that are incapable of exchanging data because of word and message

formatting differences, even though the units meet all the requirements of MIL-STD-1553 and their individual procurement specifications. In this case, the system designer is faced with the choice of using additional processing equipment to translate words and messages from one subsystem to another or modifying the off-the-shelf hardware to achieve integration. Usually the job of data manipulation falls on the bus controller-processor. Messages from each subsystem must be transmitted to the bus controller (RT to bus controller), which constructs new words with the appropriate engineering units, scaling, encoding, bit positions, etc., before retransmission (bus controller to RT) to the subsystem requiring the data. Word order is another message inconsistency that must be resolved. The solution to this problem does not lie in bus controller manipulation or in subsystem modifications; it lies in establishing common usage word formats and common usage output message formats to provide a subsystem designer the information required to build compatible communication interfaces.

This chapter is subdivided to allow easy access when selecting the appropriate word or message format from the standards available. For signals that do not fit the standard word formats available, guidelines are provided for establishing the appropriate word format. Common signal naming practices and an ICD presentation format are provided. Some of the key benefits gained by use of the principles presented in this chapter will be (1) subsystem word format definition, (2) common signal naming practices, and (3) standardization of ICD format across programs. The guidelines required for developing message formats and an ICD presentation format are also provided.

11.2 WORD FORMATS

A word format is the structure, order, and value represented by the bits in a signal data transmission. To properly define a data word format requires knowledge concerning the signal, the 1553 application, and the codi.g technique used to communicate the information. All of these elements are discussed in the following paragraphs.

The general rules for 1553 word construction (paragraph 11.2.2) apply to all data words whether standard or nonstandard. These rules are to be followed in the development of words that do not fit the formats listed in the standard word tables (paragraph 11.2.5). The procedures on how to construct a data word format described in paragraph 11.2.3 also apply to any data word whether or not it is eventually determined to fit a standard format. Paragraph 11.2.1 describes the standardized ICD presentation format that should be used for all 1553 words.

11.2.1 Interface Control Document Signal Presentation Format

The ICD format required for the documentation of all words in a 1553 system is shown in Tables 11.2-1 and 11.2-2. Presentation formats are provided for single word (Table 11.2-1) and double precision (Table 11.2-2). Signals that require more than two words should use the single word format with the number of words indicated in the REMARKS section (e.g., "3 word quantity--word 1 of 3") of the word format presentation sheet. The ICD presentation sheet entries are discussed in the following paragraph.

Table 11.2-1. Presentation Format, Single Word

DOC. NO. REV.
DATE
SHEET 1 OF

WORD NAME :

WORD ID	:	MAX VALUE	:
SOURCE(S)	:	MIN VALUE	:
DEST(S)	:	RESOLUTION	:
COMP RATE	:	ACCURACY	:
XMIT RATE	:	MSB	:
SIGNAL TYPE	:	LSB	:
UNITS	:	FULLSCALE	:

FIELD NAME	BIT NO.	DESCRIPTION
	-00-	
	-01-	
	-02-	
	-03-	
	-04-	
	-05-	
	-06-	
	-07-	
	-08-	
	-09-	
	-10-	
	-11-	
	-12-	
	-13-	
	-14-	
	-15-	

REMARKS:

Table 11.2-2. Presentation Format, Double Precision

DOC. NO. REV.
DATE
SHEET 1 OF

WORD NAME :

WORD ID	:	MAX VALUE	:
SOURCE(S)	:	MIN VALUE	:
DEST(S)	:	RESOLUTION	:
COMP RATE	:	ACCUR ACY	:
XMIT RATE	:	MSB	:
SIGNAL TYPE	:	LSB	:
UNITS	:	FULL SCALE	:

FIELD NAME	BIT NO.	DESCRIPTION
	MSW -00-	
	-01-	
	-02-	
	-03-	
	-04-	
	-05-	
	-06-	
	-07-	
	-08-	
	-09-	
	-10-	
	-11-	
	-12-	
	-13-	
	-14-	
	-15-	
	LSW -00-	
	-01-	
	-02-	
	-03-	
	-04-	
	-05-	
	-06-	
	-07-	
	-08-	
	-09-	
	-10-	
	-11-	
	-12-	
	-13-	
	-14-	
	-15-	

REMARKS:

Tables 11.2-1 and 11.2-2 are the skeleton ICD sheets. Figures 11.2-1 and 11.2-2 provide the detailed layout for the ICD presentation sheets. The definition of each entry is as follows:

DOC. NO.: The interface control document number.

REV.: The revision symbol for this sheet.

DATE: The calendar date of the latest revision to this sheet.

SHEET 1 OF #: This sheet count allows multiple sheets.

WORD NAME: The formal name selected for this word as described in paragraph 11.2.4, Naming.

WORD ID: Code identifying the message of which this word is part. The WORD ID is constructed as follows:

XXXXSX-YYYYSY-W# or XXXXSX-YYYYSY-W#/W#
where:

XXXX = Transmitting terminal name (see Table 11.2-3 for examples). Transmitting terminal has T/R bit = 1.

SX = Transmitting terminal 1553 subaddress from which the word originated.

YYYY = Receiving terminal name (see Table 11.2-3 for examples). Receiving terminal has T/R bit = 0.

SY = Receiving terminal 1553 subaddress to which the word is addressed.

W# = Word number of single word.

W#/W# = Word numbers of double word.

(XXXXSX-YYYYSY is the message ID).

The rules for WORD ID construction are:

Entries in XXXX and YYYY are four characters left-justified with trailing blanks (such as "INS1", "SMS ", "MC "). In the broadcast mode of operation, YYYY is "ALL ".

Entries in SX and SY are two numeric characters with a range of 00-31 or the characters M0 or M1. The latter characters are used in conjunction with the bus controller and the transmission of MIL-STD-1553 mode codes. M0 represents the transmission of 00000 in the subaddress/mode field of the MIL-STD-1553 command word; M1 represents the transmission of 11111 in that field. When M0 and M1 are

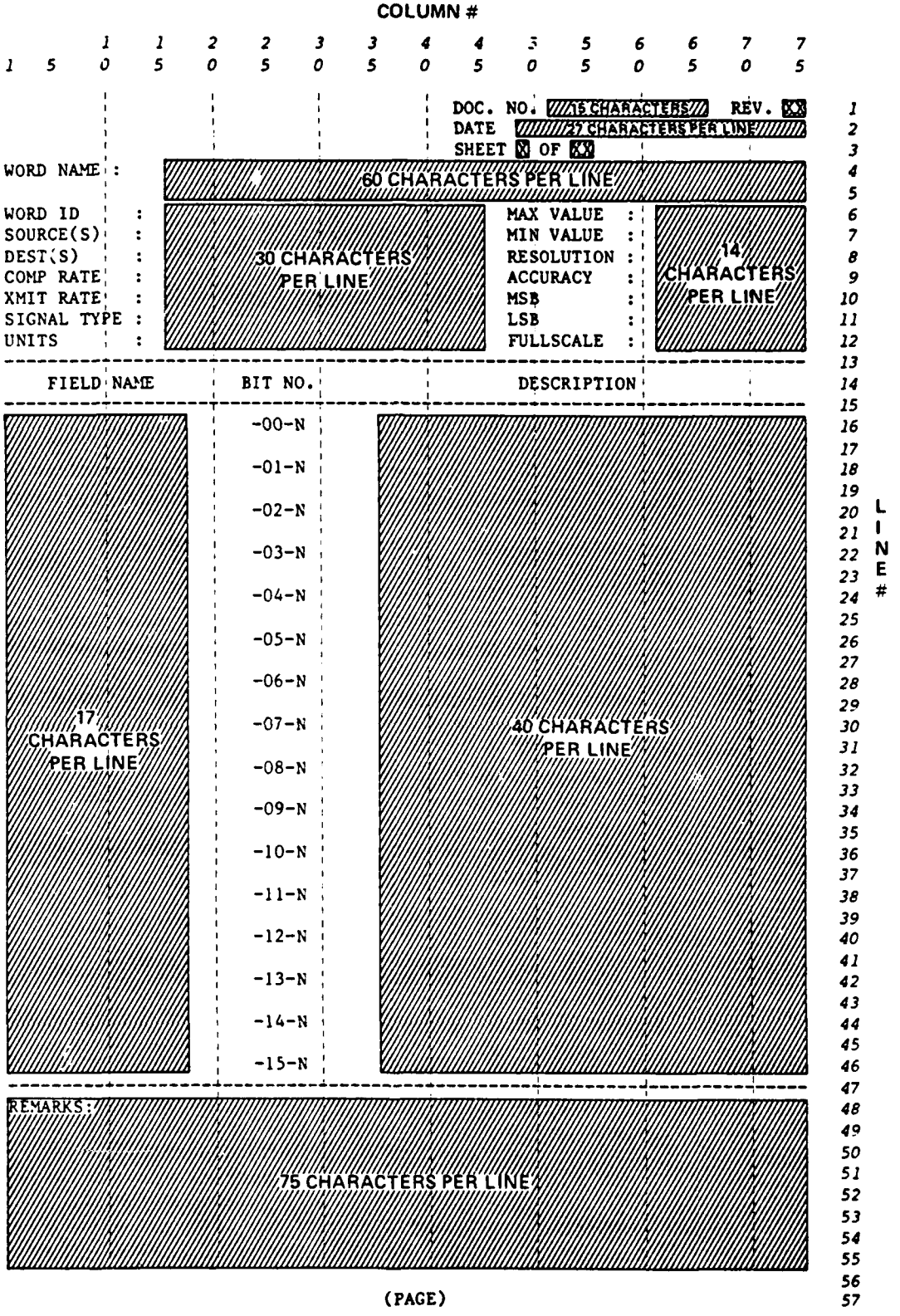


Figure 11.2-1. ICD Presentation Sheet, Single Word

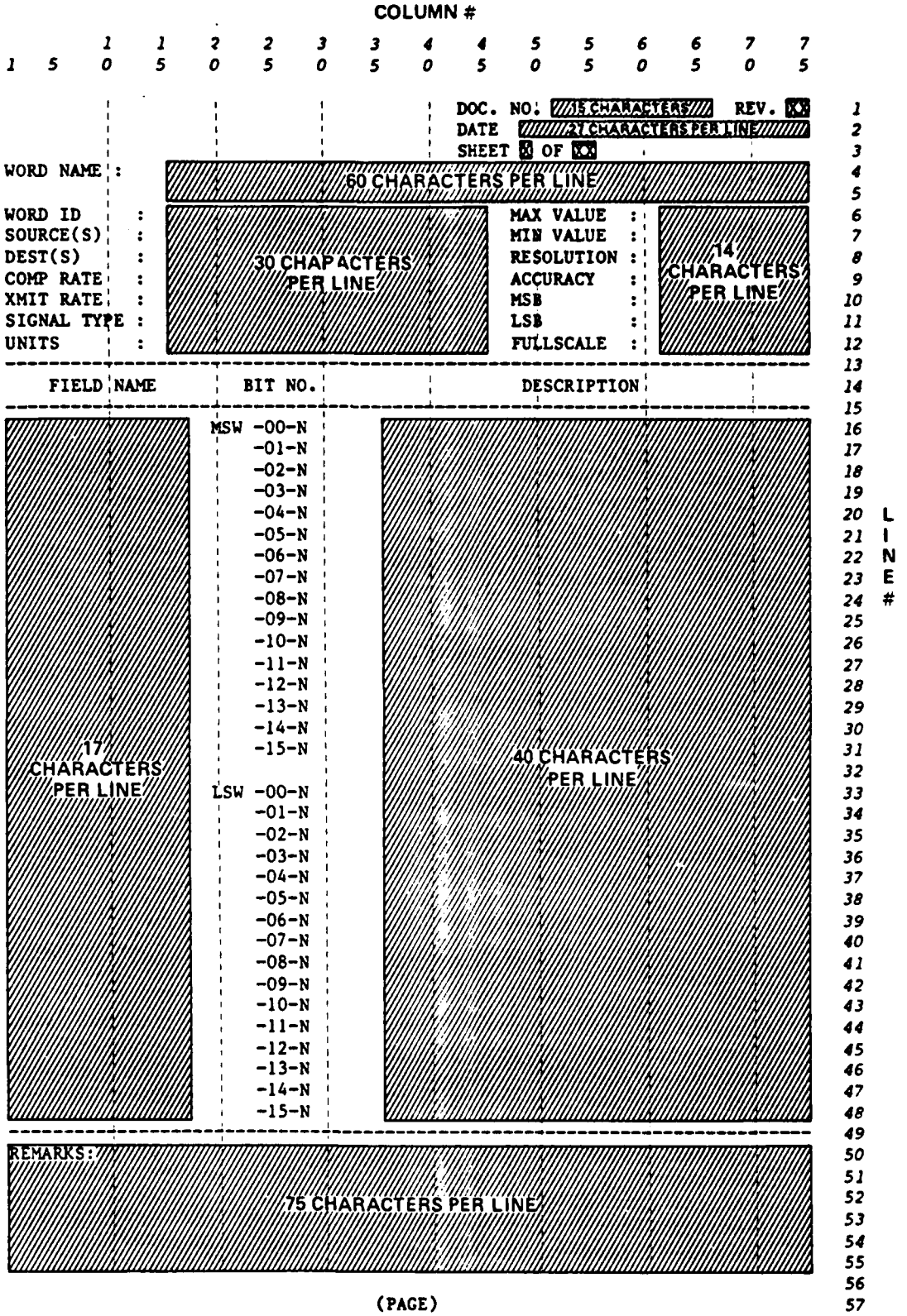


Figure 11.2-2. ICD Presentation Sheet, Double Precision

Table 11.2-3. Standard Terminal Acronyms for Use in Word ID's

ACRONYM		ACRONYM	
ADC	Air Data Computer	KY	Crypto Unit
ADF	Automatic Direction Finder	LOC	Localizer
ADI	Attitude Direction Indicator	MB	Marker Beacon
AHRS	Attitude Heading Reference System	MC	Mission Computer
AIU	Avionics Interface Unit	MFD	Multi-Function Display
ALS	Automatic Landing System	MIU	Missile Interface Unit
ASI	Airspeed Indicator	MMR	Multi-Mode Receiver
ATHS	Airborne Target Handoff System	MMS	Mast Mounted Sight
AUXS	Auxiliary Sensor	MPD	Multi-Purpose Display
BBC	Backup Bus Controller	NPU	Navigation Processing Unit
BC	Bus Controller	OM	Omega
BIU	Bus Interface Unit	PCU	Power Control Unit
CAS	Control Actuation System	PIU	PLRS Interface Unit
CDU	Control Display Unit	PNVS	Pilot Night Vision System
CNI	Communication, Navigation, Identification	RAD	Radar Altimeter
		RDR	Radar
CPU	Central Processing Unit	RIU	Radar Interface Unit
DL	Data Link	RT	Remote Terminal
DP	Display Processor	RTU	Remote Terminal Unit
DME	Distance Measuring Equipment	RWR	Radar Warning Receiver
DNC	Doppler Navigation Computer	SAS	Stability Augmentation System
DNS	Doppler Navigation System		
DTU	Data Transfer Unit	SCU	Signal Converter Unit
DVS	Doppler Velocity Sensor	SG	Symbol Generator
ECM	Electronic Countermeasures	SHVI	Standard HV Interface
EHF	Extra High Frequency Radio	SIU	Stores Interface Unit
FCC	Fire Control Computer	SL	Stores Logic
FCS	Fire Control System	SMS	Stores Management System
FIR	Flight Incident Recorder	SS	Stores Station
FLC	Flight Control	SSHV	Slave SHVI
FLIR	Forward Looking Infared	TADS	Target Acquisition Designation System
GPS	Global Positioning System		
GS	Glideslope	TCM	TERCOM
HAS	Hover Augmentation System	TCN	TACAN
HF	High Frequency Radio	TCS	Tactical Camera System
HMD	Helmet Mounted Display	TM	Telemetry
HSI	Horizontal Situation Indicator	TSC	Time Sync Controller
HUD	Head-Up Display	UHF	Ultra High Frequency Radio
HV	Host Vehicle	VDI	Vertical Direction Indicator
ICP	Integrated Control Panel		
ICS	Intercommunication System	VHF	Very High Frequency Radio
ICU	Ignition Control Unit	VOR	VHF Omni-Directional Range Radio
IFF	Identification, Friend or Foe		
ILS	Instrument Landing System	VSI	Vertical Situation Indicator
IMU	Inertial Measurement Unit		
INS	Inertial Navigation System	WCS	Weapon Control System
INU	Inertial Navigation Unit	WIU	Weapon Interface Unit
JCU	JTIDS Control Unit	WXR	Weather Radar

used as either SX or SY, the numeric entry, used in conjunction with the receive/transmit terminal, will indicate the MIL-STD-1553 mode code (the data word count/mode code field of the MIL-STD-1553 command word). For example, the word ID INS 03-BC1 M0-MCCW indicates that a Mode Command Without Data Word, (MCCW), is being commanded by the bus controller (BC1), using 00000 (M0) as the subaddress/mode, to the INS. The mode code being transmitted is Initiate Self Test (03). (See Tables 11.3-14 through 11.3-16 for the relationship between mode codes and word/message ID formats).

Entries in W# are two numeric characters with a range of 01-32. The field W#/W# is a five-character field. If the word is single precision, the last three characters will be blank. In the case of command words, this field will contain:

RCW - BC-to-RT Transfer
TCW - RT-to-BC Transfer
RTCW - RT-to-RT Transfer
MCCW - Mode Command Without Data Word
MCCDT - Mode Command With Data Word (Transmit)
MCCDR - Mode Command With Data Word (Receive)
BCCW - BC-to-RT Transfer, Broadcast
BCCRT - RT-to-RT Transfer, Broadcast
BCMC - Mode Command Without Data Word, Broadcast
BCMCD - Mode Command With Data Word, Broadcast

In the case of status words, this field will contain:

TSW - Transmit Status Word
RSW - Receive Status Word

Examples of typical WORD ID's are shown in Table 11.2-4.

SOURCE(S): Name(s) of the subsystem(s) originating the word, usually abbreviated or an acronym. When a word is modified by a subsystem, that subsystem becomes the originating source. Source information is used to allow tracking of data from the originating source to all destinations.

DEST(S): Name(s) of the subsystem(s) that will receive the word, usually abbreviated or an acronym. Destination information is used to allow tracking of data back to the originating source and to other destinations.

COMP RATE: The rate in times per second (Hz) that the data is computed.

XMIT RATE: The nominal rate in times per second (Hz) that the message is transmitted.

Table 11.2-4. Word ID Examples

WORD ID	MIL-STD-1553 TRANSFER TYPE	DESCRIPTION
INS 03-FLIR02-07	RT-to-RT	INS is transmitting word number 07 from subaddress 03 to subaddress 02 of FLIR.
AHRS03-MC BC-07	RT-to-BC	AHRS is transmitting word number 07 from subaddress 03 to the MC (which is the bus controller).
BC1 BC-HUD205-07/08	BC-to-RT	BC1 (the bus controller) is transmitting word number 07 and 08 to subaddress 05 of HUD2.
NPU BC-ALL 04-15	Broadcast	NPU (the bus controller) is transmitting word number 15 to subaddress 04 in the broadcast mode of operation.

SIGNAL TYPE: 2's complement--A representation of a signed value where the negative codes are generated by adding one to the complement of the number. The use of 2's complement in a digital computer facilitates the subtraction process.

Unsigned numeric--A binary representation of an unsigned value. The value may be an integer or may have a fractional component.

Discrete--A single binary bit whose state of one or zero has a specified meaning.

Coded--A grouping of bits in which the pattern of ones and zeros has a specified meaning.

Binary Coded Decimal (BCD)--The natural binary coded decimal (NBCD) or four-bit (8421) code is a special BCD form. The NBCD code allows only 10 (0-9) valid states, with the values 10-15 being invalid.

ASCII--A seven-bit binary code representing alpha and numeric characters.

ASCII-8--Extended ASCII using eight bits for additional character representations.

UNITS: The engineering units of the transmitted signal.
Note: Some words may be unitless.

MAX VALUE: The maximum value that the signal, as supplied by the subsystem, can attain. MAX VALUE must be less than or equal to FULLSCALE.

MIN VALUE: The minimum value that the signal, as supplied by the subsystem, can attain.

RESOLUTION: Resolution is defined as the minimum detectable change in value of the signal, as supplied by the subsystem.

ACCURACY: The accuracy of the signal as supplied by the subsystem.

MSB: The value of the most significant bit of the word and/or field.

LSB: The value of the least significant bit of the word and/or field.

FULLSCALE: The maximum value the data field can attain (two times MSB).

FIELD NAME: The formal name selected for a signal describing a bit, field, or single or double precision word.

BIT NO: BIT NO. is as defined in paragraph 11.2.2.1.

DESCRIPTION: A functional description of the signal.

MSW: Most significant word of a double precision signal.

LSW: Least significant word of a double precision signal.

REMARKS: (Optional) Additional comments, if needed, pertaining to the word.

PAGE: Page No. of the ICD.

11.2.2 General Rules for MIL-STD-1553 Word Construction

The general rules for constructing compatible word formats apply to the standard words listed in paragraph 11.2.5 and to those words that do not meet the requirements for the standardized format. The following paragraphs provide generalized rules for establishing the basic word structure.

11.2.2.1 Data Word/Bit Designation

Figure 11.2-3 shows the horizontal presentation of the 16-bit data field of the data word defined in MIL-STD-1553. The data field bits are numbered 00 through 15, left to right, with bit 00 designated as the most significant bit (MSB) and bit 15 designated as the least significant bit (LSB). In conformance to the requirements of MIL-STD-1553, the most significant bit (bit 00) is transmitted first on the data bus.

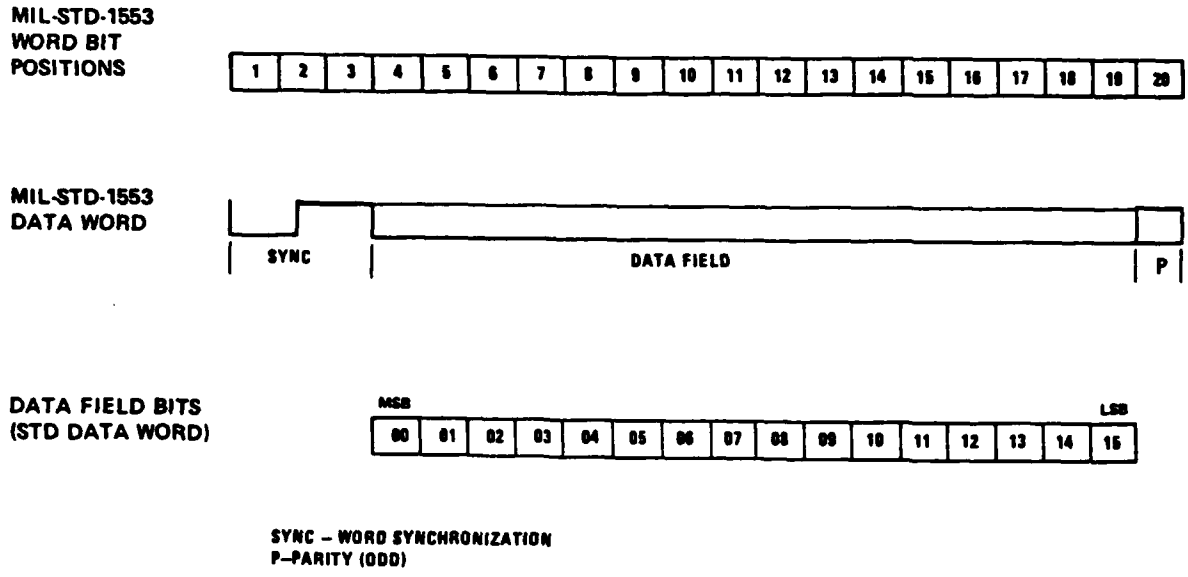


Figure 11.2-3. Standard Data Word/Bit Designation Related to MIL-STD-1553 Word Definition

The MSB and LSB designations indicated here refer to the relative weighting of the entire 16 bits in a 2's complement representation of signal value. The MSB and LSB designations will also be employed to define the most significant and least significant bits of parameters requiring less than or more than 16 bits. There can also be more than one signal value in a data word, thus requiring multiple MSB's and LSB's within the data field. Discrete bits and binary codes are also used to represent characters or modes. Throughout this document the term "data word" will be used in reference to this 16-bit data field.

11.2.2.2 Signal Coding and Placement

Several coding techniques are provided because of the variety of signal types that must be accommodated in a data word format. The following are the typical coding conventions and the presentation notations:

Data Type	Presentation Notation
a. 2's complement	Sign, MSB, LSB, and N (data bits)
b. Unsigned numeric	MSB, LSB, and N (data bits)
c. Discrete bit	D
d. Coded bits	MSB, LSB, and C (data bits)
e. Binary coded decimal (NBCD, 8421)	MSB, LSB, and B (data bits)
f. ASCII alphanumeric codes	MSB, LSB, and A (data bits)

g.	Validity bit	V
h.	Unused or reserved bits, logic 0	0
i.	Logic 1	1
j.	Floating point	MSB, LSB, Sign, & M (Mantissa) (data bits) MSB, LSB, Sign, & E (Exponent) (data bits)

Figure 11.2-4 shows some examples of typical word formats employing the above digital representations. The following general rules apply to all word structures:

a. The MSB shall always be transmitted first, in accordance with MIL-STD-1553.

b. All spare or unused bits shall be transmitted as logic 0's, in accordance with MIL-STD-1553.

c. In the event that multiple precision quantities (information accuracy or resolution requiring more than 16 bits) are transmitted, the most significant bits shall be transmitted first, followed by the word(s) containing the less significant bits in descending numerical order, in accordance with MIL-STD-1553.

d. The numerical value of the data should be represented using 2's complement notation. The value of the MSB should be an integer power of 2.

e. Left justify; the sign, MSB, or first discrete (in that order of precedence) should appear in the leftmost (bit 00) position.

f. No unused zero (0) bits should be placed in more significant bit positions than data. The exception to this rule is ASCII-7. In standard 7-bit ASCII, the first bit of each character field (MSB) is set to logic zero(0), and the 7-bit ASCII code occupies the remaining seven bits of the field.

g. Combining numeric data with discrete or coded data in the same word should be avoided.

h. Packing of discretes with coded data of similar functions within the receiving subsystem should be limited.

11.2.2.2.1 2's Complement

Several potential implementations for the positioning of 2's complement data were compared with each other and evaluated for consideration as a recommended standard. These implementations are:

a. Left justification of data and sign bit

b. Right justification of data and sign bit

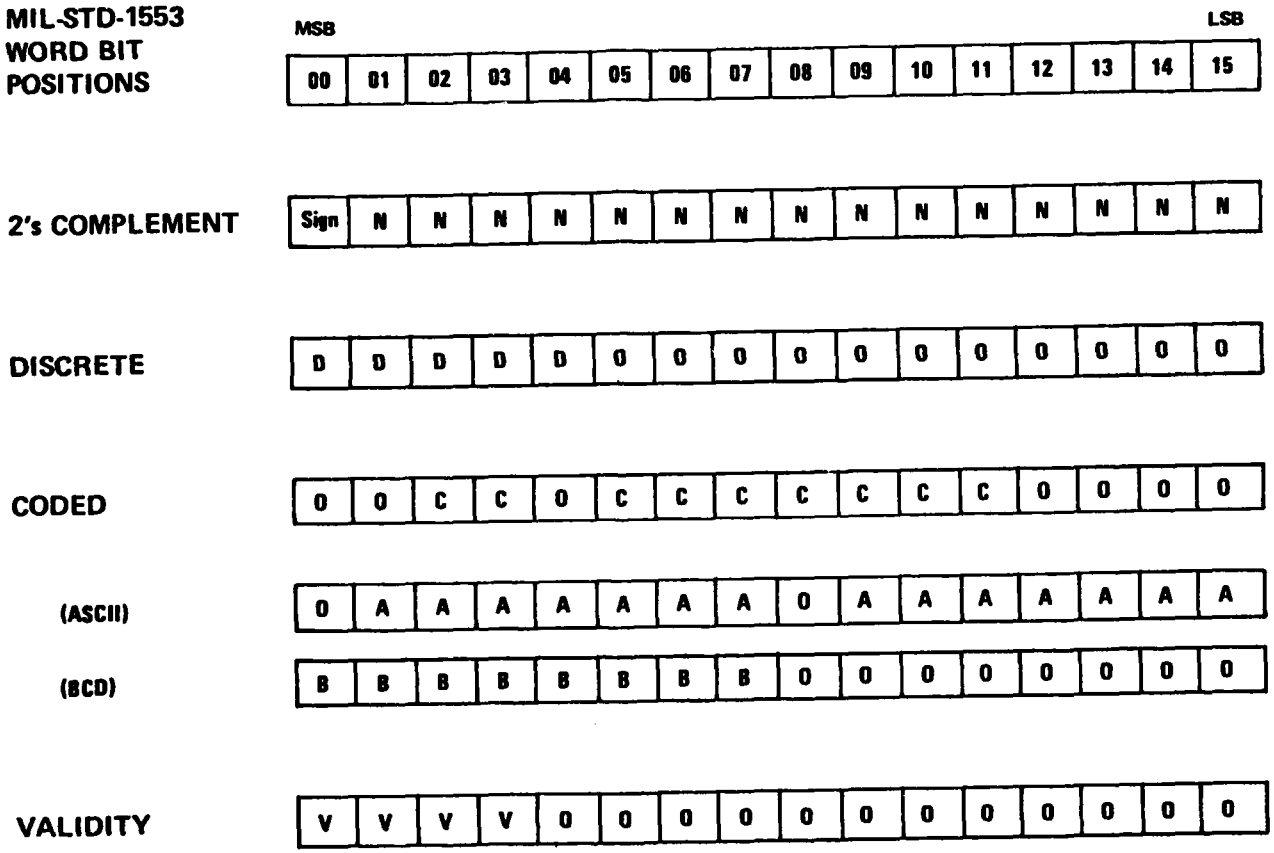


Figure 11.2-4. Word Format Examples

c. Sign left-justified and value right-justified

> The format for 2's complement data (see Figure 11.2-4) should be one data item per word, left-justified with sign bit in bit position 00.

The sign bit is designated as the leftmost bit of the data word to facilitate use of the arithmetic shift instructions available with many processors. The arithmetic shift instructions will left-justify the data (preparing for transmission) or shift the data to the right (moving received data from input buffer) while maintaining the integrity of the sign bit. This is not possible with right-justified data and sign bit because arithmetic shift instructions assume the sign bit to be bit 00.

If the data and sign bit were right-justified, special routines would have to be written to move the information to the left since most processors look for the sign bit in the leftmost bit position.

The implementation in which the sign bit is left-justified and the value right-justified provides for range increase with no change to the data word required. However, there are also some problems with this method: (1) extra processing time and memory would be required to put the two pieces of information together for storing and (2) it could require storage of all 16 bits of information regardless of how many bits are actually needed to transfer the data. All but a few of the fixed-point data words examined in the source documents were in the recommended format.

11.2.2.2.2 Unsigned Numeric

Unsigned numeric data is any parameter, whether integer or fractional, that is transmitted only as a positive value. Unsigned numeric data should only be used when 16-bit range or resolution is required. The use of 2's complement representation is highly preferred.

> The format for unsigned numeric data should be one data item per word, occupying all 16 bits. The value of the MSB should be an integer power of 2.

11.2.2.2.3 Discrete Bit

Several potential implementations for packing discrete data were compared with each other and evaluated for consideration as a recommended standard. These implementations are:

a. Group all data bits in leftmost positions

b. Group all data bits in rightmost positions

c. Intersperse data bits with spares

The format for packing discrete data should be to group only functionally related data bits and pack them on the left side of the word with no spares interspersed (see Figure 11.2-4). Discretes should be named so that the name indicates a true (1) condition (e.g., RANGE INVALID = 1).

If all data bits are grouped in the leftmost positions, the leftmost bit can be tested for positive indication, then shifted to the left, the following bit tested and shifted, etc. This software method is an efficient way of processing discrete bits. One reason for this is that it requires less coding because the test-shift routine can be used repeatedly by looping. A single, simple subroutine is therefore capable of handling any grouping of single-bit discrete data fields. Another advantage to putting the data on the left and the spares on the right is that is allows for future expansion with minimal change to existing code.

If the data bits are grouped in the rightmost positions, the entire group of data bits can be read as an integer (without shifting) and this integer value used as an index. Although this is a valid software technique, its application is limited.

By interspersing spares throughout the data, functionally unrelated data can be separated. The disadvantage of this practice is that it can make the system difficult to understand and thus difficult to maintain. In addition, the interspersed spare bits will cause problems if the test-shift method of reading data is used. Rather than use spares as separators, it is recommended that unrelated data be put in different words.

11.2.2.2.4 Coded Bits

Several potential implementations for packing coded data were compared with each other and evaluated for consideration as a recommended standard. These implementations are:

a. LSB or each field positioned on a full-, half-, or quarter-word boundary, filling in leftover bits with spares.

b. All data grouped together in the leftmost bits.

c. MSB of each field positioned on a full-, half-, or quarter-word boundary.

The format for packing a coded data type should be to position the LSB of each field on a full-, half-, or quarter-word boundary (see Figure 11.2-4).

A coded data type is a parameter set containing uniquely coded values (composed of two or more bits within the set rather than a continuous range of values). Examples of coded data are alphanumerics (ASCII), switch setting codes, and weapon type codes.

It is recommended that the LSB of all fields be placed on full-, half-, or quarter-word boundaries because many processors have instructions to read full-, quarter-, or half-words. If the fields are not on a boundary, the number of instructions is increased, processing time is increased, and the coding becomes more complex.

There are drawbacks to this method. It does not permit easy future expansion within a word. In addition, bus loading may be increased since this method uses more words than would be used if the data were packed in the leftmost bits.

11.2.2.2.5 Validity Bit

Several potential implementations for positioning of validity bits were compared with each other and evaluated for consideration as a recommended standard. These implementations are:

a. Positioning the validity bit in the same word as the data item to which it applies.

b. Placing all validity bits in a validity word.

The format should be to place all validity bits in a validity word and to left-justify the validity bits (see Figure 11.2-4).

Keeping the validity bit in the same word as the data to which it applies rather than in a separate validity word decreases the bus loading. It also allows only one word at a time to be operated on, thus decreasing processing time.

11.2.2.2.6 Floating Point

The representation of floating point data has been left to the discretion of the system designer. All of the floating point representations examined were based on servicing specific system processors. It is anticipated that this will be true in future systems and, therefore, the floating point representation used should reflect the representation in the target processor. The Army, Navy, and Air Force all have standard floating point representations, described in MIL-STD-1862, AN/AYK-14 Programmer Reference Manual (14122000), and MIL-STD-1750, respectively.

MIL-STD-1862 provides single length (32-bit) and double length (64-bit) floating point representations. The 32-bit representation has a sign bit as the MSB, followed by an 8-bit exponent and a 23-bit fraction. The 64-bit representation has a sign bit as the MSB, followed by an 11-bit exponent and a 52-bit fraction.

MIL-STD-1750 provides 32-bit and 48-bit floating point representations. The 32-bit representation has a sign bit as the MSB, followed by a 23-bit mantissa (fraction) and an 8-bit exponent. The 48-bit representation has a sign bit as the MSB, followed by a 23-bit mantissa, an 8-bit exponent, and 16 bits representing the least significant portion of the mantissa.

The AN/AYK-14 provides a 32-bit floating point representation with the exponent sign bit as the MSB, followed by a 7-bit exponent, a mantissa sign bit, and a 23-bit mantissa.

11.2.3 How To Construct a Data Word Format

The purpose of this paragraph is to guide the user through the task of establishing the specific data word formats needed for system integration. The information required to start this process is, as a minimum, a signal list. The task will be easier if more information about each signal is known, such as engineering units (if any), maximum and minimum values, resolution, accuracy, and computation rate. This signal information will be required for each signal of the signal list before the word and message format definition can be completed.

The method for establishing a data word format is presented as a flowchart in Figure 11.2-5 with an explanation following:

a. Select a signal. Example: present position latitude.

b. Refer to Table 11.2-5, Index of Signal Categories, and find the category that applies to the signal. In the example signal, present position latitude, the keyword is latitude. Latitude is an angular measurement; therefore, the signal falls in the "angular" category. Note that Table 11.2-5 is divided into categories for signals with engineering units and categories of unitless signals. It will be easier to find the appropriate category if it is known whether the signal is unitless or which units apply. The use of keywords and modifiers associated with each category may aid in identifying the correct category.

   After the signal category is determined, go to Step e.

   If the category cannot be determined or there is uncertainty whether the signal really fits in a given category, go to Step c.

c. If there is still uncertainty about the signal category, get a better definition of the signal. Determine more descriptive or functional details about the signal, including the source, destination, name, and engineering units (if any). Then go back to Step b. Otherwise, go to Step d.

d. If the signal definitely does not fall into any of the listed categories, refer to paragraph 11.2.2, General Rules for MIL-STD-1553 Word Construction, for general guidance in establishing the data word format for this signal.

e. Refer to Table 11.2-6, Standard Data Word Format Index. Using the category identified in Step b (from Table 11.2-5), select the appropriate units and precision, and note the standard data word format table number. Those formats indicated as double precision may be used as either a single or double precision word, based on the requirements of the particular application.

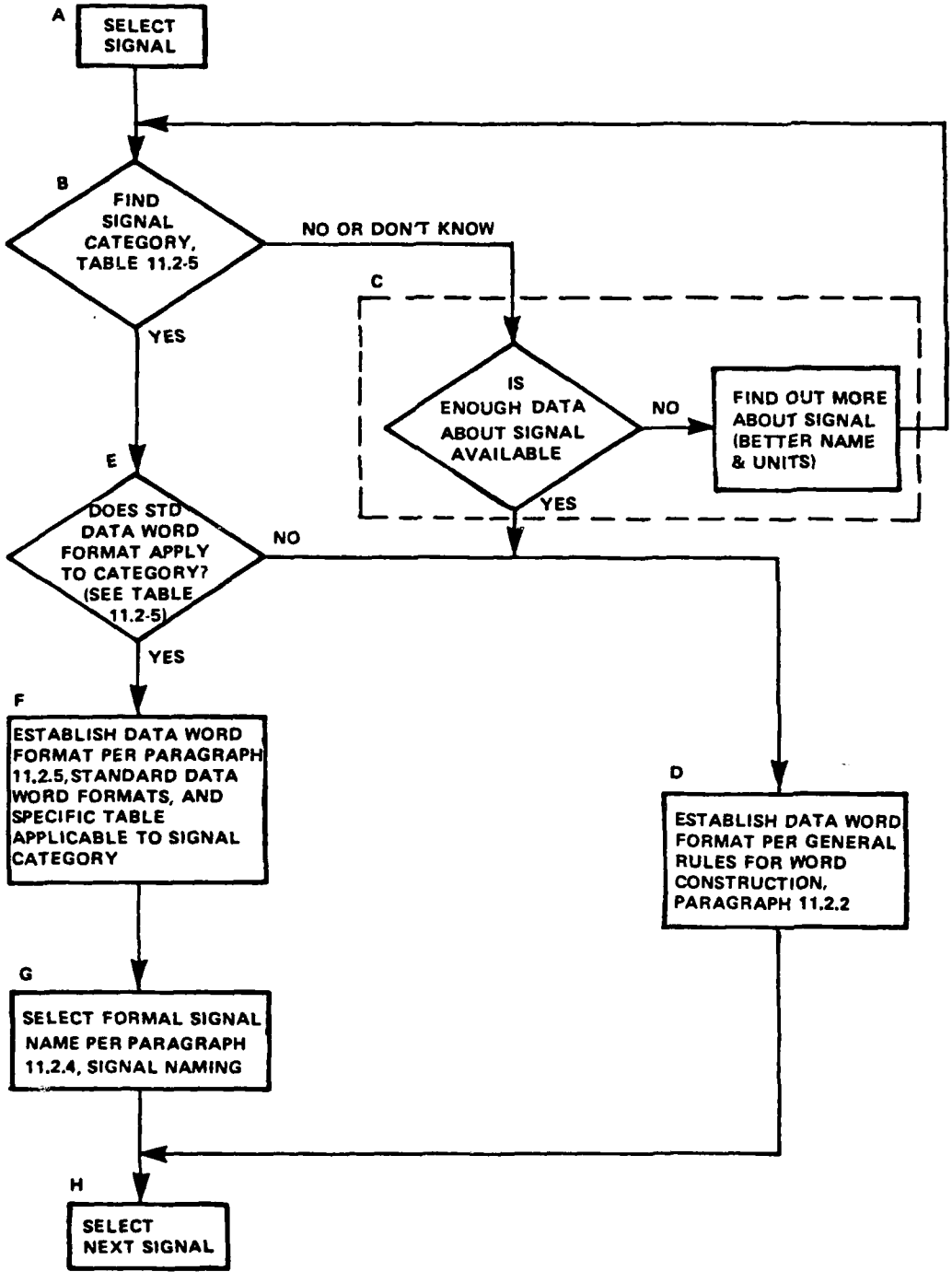


Figure 11.2-5. Establishing a Data Word Format

Table 11.2-5. Index of Typical Signal Categories (Sheet 1 of 6)

ACCELERATION Tables 11.2-7 and 11.2-8		ANGULAR Table 11.2-9		ANGULAR ACCELERATION Table 11.2-10		ANGULAR VELOCITY Table 11.2-11		ASCII DATA Table 11.2-12	
Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers
Acceleration	Down East Lateral Longitudinal Normal North Target, X Target, Y Target, Z Turret X Y Z	Angle	AOA (Angle-of-Attack) AOA, Error AOA, True Drift Ground Track Ground Track, Present Pitch Roll Sideslip Steering Tilt Wander	Acceleration	Down East North Pitch Roll Yaw	Gyro Bias	Correction X Correction Y Correction Z	Bar	Horizontal Vertical
		Azimuth	Cross Hair Error Platform Relative Relative to Steerpoint Relative to Nth Waypoint Relative to Nth Markpoint Symbol			Rate	Angular Azimuth Deflection Elevation Pitch Rotation Yaw	Character	Left Middle Right
		Bearing	(Same as Azimuth)					Display	Alpha Border Branch Character Control Data Intensity Miscellaneous Numeric Position Radar Symbol Window
		Course	Desired Ground Track Magnetic, Computed Magnetic, Inserted					Symbol	Control Identification Internal Reference
		Elevation	Bullet Circle Command Angle Error LOS (Loss-of-Signal) Position Reference, Aircraft Scale Target						
		Heading	Error Magnetic Magnetic, Inserted Magnetic, Present True True, Inserted True, Present						
		Latitude	Markpoint Nth Markpoint Nth Waypoint Present Position, Inserted Waypoint Position, Inserted						
		Longitude	(Same as Latitude)						
		Variation	Magnetic, Computed Magnetic, Inserted						

Table 11.2-5. Index of Typical Signal Categories (Sheet 2 of 6)

BCD DATA Table 11.2-13		CONVERGENCE FACTOR Table 11.2-14		COSINE/SINE Table 11.2-15		COUNTS Tables 11.2-16 and 11.2-17	
Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers
Channel	Select	Convergence Factor	Inserted Present, In Use	Cosine	Direction a. CXX (Reference Platform CXY to Earth CXZ Coordinate System) b. DIRXL (Reference A/C Body DIRYL Coordinate System) DIRZL c. DIRCOSX (Same as b) DIRCOSY DIRCOSZ Heading Pitch Roll	Counts	Track Control, RN Track Control, N
IFF	Code Control Interrogator					Date	Julian Year
ILS	Channel Mode					Frames	Film Recording Data
Radio	Select Status Test					Pulses	Ripple
Receiver	Channel Command Frequency Tune					Revolutions	Revolutions Per Minute Rotor Speed No. n
RF	Channel Disposition Level Transmit			Sine	Heading Pitch Roll	Rounds	Remaining
TACAN	Channel Mode					Words	Instrumentation Port Data
UHF/VHF	Channel Mode						
VOR	Channel Mode						

Table 11.2-5. Index of Typical Signal Categories (Sheet 3 of 6)

DATA VALIDITY Tables 11.2-18 and 11.2-19		DEVIATION Table 11.2-20		DISTANCE Tables 11.2-21 through 11.2-25			
Keyword	**Typical Modifiers**	**Keyword**	**Typical Modifiers**	**Keyword**	**Typical Modifiers**	**Keyword**	**Typical Modifiers**
Error Protection	(None)	Deviation	Glideslope Localizer	Altitude	Above Fixpoint Barometric Barometric Reference Desired Electronic Altimeter Helo (Helicopter) Inertial Pressure Radar Sonobuoy Launch Store System Target	Rate Position	Acquisition Cursor
Checksum	Bits Word					Separation	Impact
Validity	Bit Data Discretes					Wingspan	(None)
						X	Cursor Correction Cursor Total Delta Display Delta Display Position Display - Translate Helo Position Helo Position at Initialization Ownship Position Pointer Position Position Position, Fly-to-Point Sonobuoy Position Symbol Position
				Azimuth	Cursor Deviation Steering Steering Dot		
				Circle	Display		
				Distance	To Nth Waypoint/Markpoint To Steerpoint	Y	(Same as X)
				Easting	Inserted Position Inserted Waypoint Nth Waypoint/Markpoint UTM Present Position UTM	Z	Cursor Total Position
				Elevation	(Same as Azimuth)		
				Error	Allowable Steering Cross Track Position East Position North		
				Height	Above Target (HAT)		
				Northing	(Same as Easting)		
				Range	Aircraft Symbol Contact Ground Track, Incremental Manual Maximum Minimum Pull Up Radar Slant TACAN Tactical X, Relative Target Y, Relative Target Z, Relative Target		

Table 11.2-5. Index of Typical Signal Categories (Sheet 4 of 6)

FLOW Tables 11.2-26 and 11.2-27		FREQUENCY Tables 11.2-28 through 11.2-30		MASS Tables 11.2-31 and 11.2-32		PERCENT Table 11.2-33	
Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifier	Keyword	Typical Modifiers
Fuel Oil	(None) (None)	Frequency	ADF-n HF-n UHF-n VHF-n	Mass	Aircraft Fuel Ordnance Payload	Percent	(None)

Table 11.2-5. Index of Typical Signal Categories (Sheet 5 of 6)

PRESSURE Tables 11.2-34 and 11.2-35		RATIO Table 11.2-36		TEMPERATURE Table 11.2-37		TIME Tables 11.2-38 through 11.2-40	
Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers
Differential	Pressure Altitude	Ratio	Air Density	Temperature	Celsius	Calendar	(None)
Discharge	Compressor		Pressure		Engine Inlet	Clock	Kalman
	Turbine				Exhaust Gas	Time	Align
Oil	Engine				Fuel Inlet		Almanac Reference
Impact	Indicated				Outside Air		Coordinated Universal
Static	Indicated				Total		Greenwich Mean
					True Freestream Air		Of Day
							Sonobuoy, Last Correct
							Sonobuoy Launch
							Symbol
							Tag
						Time To	Destination
							Go
							Nth Waypoint/Markpoint
							Steerpoint

Table 11.2-5. Index of Typical Signal Categories (Sheet 6 of 6)

TORQUE Table 11.2-41		UTM Table 11.2-42		VELOCITY Tables 11.2-43 through 11.2-47		VOLTAGE Table 11.2-48	
Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers	Keyword	Typical Modifiers
Engine	(None)	UTM	Area Datum Grid Zone Easting Northing Spheroid 100,000 Meter Grid Zone	Airspeed	Calibrated Indicated True	Voltage	Display Intensity Fore/Aft Cursor Deflection Left/Right Cursor Deflection Stick X Deflection Stick Y Deflection
Shaft	(None)			Groundspeed	Predicted Present Tail Warning System		
				MACH	Number		
				Range Rate	None		
				Speed	Bias Desired Ground Helo Helo Wind Ownship Symbol True Water		
				Velocity	Correction X Correction Y Doppler Drift Doppler Heading Doppler Vertical Down Drift East Heading North Vertical Wind X X, Relative Target Y Y, Relative Target Z Z, Relative Target		

Table 11.2-6. Standard Data Word Format Index (Sheet 1 of 2)

Category	Units	Word(s)/ Precision	Table No.
Acceleration	Metres/Second/Second	Double	11.2-7
	Feet/Second/Second	Single	11.2-8
Angular	Semicircles	Double	11.2-9
Angular Acceleration	Semicircles/Second/Second	Single	11.2-10
Angular Velocity	Semicircles/Second	Double	11.2-11
ASCII Data	Unitless (Character)	One	11.2-12
BCD Data	Unitless (Channel Select)	One	11.2-13
Convergence Factor	Unitless	Single	11.2-14
Cosine/Sine	Unitless	Double	11.2-15
Counts	Unitless (Signed)	Single	11.2-16
	Unitless (Unsigned)	Single	11.2-17
Data Validity	Unitless (Checksum)	Single	11.2-18
	Unitless (Error Protection)	One	11.2-19
Deviation	Difference in Depth of Modulation (DDM)	Single	11.2-20
Distance	Metres	Double	11.2-21
	Feet	Double	11.2-22
	Kilometres	Double	11.2-23
	Nautical Miles (Low Range)	Single	11.2-24
	Nautical Miles (High Range)	Double	11.2-25
Flow	Kilograms/Hour (Low Range)	Single	11.2-26
	Kilograms/Minute (High Range)	Single	11.2-27
Frequency	Hertz	Four	11.2-28
	Kilohertz (ADF)	One	11.2-29
	Megahertz (VHF/UHF)	One	11.2-30
Mass	Kilograms (Low Range)	Single	11.2-31
	Kilograms (High Range)	Single	11.2-32
Percent	Unitless	Single	11.2-33
Pressure	Kilopascals	Double	11.2-34
	Inches of Mercury	Single	11.2-35
Ratio	Unitless	Single	11.2-36

Table 11.2-6. Standard Data Word Format Index (Sheet 2 of 2)

Category	Units	Word(s)/ Precision	Table No.
Temperature	Celsius	Single	11.2-37
Time	Month,Day,Hour,Minute,Second	Three	11.2-38
	Microseconds (Time Tag)	Double	11.2-39
	Seconds (Time To)	Single	11.2-40
Torque	Newton-Metres	Double	11.2-41
UTM	Unitless	Five	11.2-42
Velocity	Metres/Second	Double	11.2-43
	Feet/Second	Double	11.2-44
	Kilometres/Hour	Single	11.2-45
	Knots	Single	11.2-46
	Mach Number	Single	11.2-47
Voltage	Volts	Double	11.2-48

For the example signal, present position latitude, the correct category is "Angular". In the standard data word format column of the table we find and note for later use the reference to Table 11.2-9. Find the category of your signal in Table 11.2-6 and note the tables referenced in the standard data word format column.

f. Refer to paragraph 11.2.5, Standard Data Word Formats, and the applicable tables (noted in Step e). Construct the data word format and complete the ICD data sheet(s) for this signal.

g. A necessary part of data word format development is the selection of a formal signal name for each signal. Refer to paragraph 11.2.4, Naming, to select the formal signal name. Proceed to Step h.

h. Select next signal and start the process at Step b.

11.2.4 Naming

A necessary part of data word format development is the selection of a formal signal name for each signal. A naming convention will make signals more easily traceable within an integrated system as well as across various systems.

The basic principle for naming signals consistently is placing the most important word (keyword) first, followed by modifiers. The keyword is the word

most closely related to the category or engineering units (if any) of the signal. The keyword may be the same as the signal category. Appropriate modifiers should be added as required to create a unique signal name for each data word within the system. For example, "latitude, present position, INS."

Table 11.2-5 presents typical signal names by category. Within each category is a list of keywords associated with that category and some typical modifiers associated with those keywords. This table should be helpful in selecting a formal signal name by using the following procedure:

a. Find the appropriate category for your signal. For our example signal, present position latitude, the category is "Angular".

b. Determine if your signal's keyword is listed. For the example signal, present position latitude, the keyword is "latitude".

c. If your signal's keyword is not listed under the appropriate category, consider using the category name as your signal's keyword. If the category name is an inappropriate keyword for your signal, choose the most meaningful word in the name as the keyword.

d. Define your signal's formal name by placing the keyword first, followed by the remaining words (modifiers). Table 11.2-5 also lists some typical modifiers for common keywords. The formal name for our example signal would therefore be "latitude, present position."

e. Return to paragraph 11.2.3 to complete data word format definition.

11.2.5 Standard Data Word Formats

This paragraph presents the standard data word formats, and provides the user guidance necessary to fit real-life signals into the standard data word formats. An example signal is used to illustrate the application of the standard data word formats to real-life signals. The derivation of the example data word is presented in the following paragraphs, and the completed data word format is presented in Figure 11.2-6. Figure 11.2-7 depicts the standard vehicle fixed-axis coordinate system. Other coordinate systems referenced in the ICD should be similarly illustrated.

Table 11.2-6 is an index that keys the user into the various standard data word formats. The standard data word formats are presented in Tables 11.2-7 through 11.2-48. Having established the category of your signal (by following the steps outlined in paragraph 11.2.3), refer to the appropriate standard data word format(s), as indexed in Table 11.2-6, and to the following example for guidance.

An effective means of guiding the user in establishing data word formats for his signals is by example. We have been using a typical signal, "latitude, present position," as our example. The data word format for this signal is derived as follows. It is necessary to have certain information about the signal before the data word format can be defined. For signals that have engineering units, the minimum necessary information is as follows on page 11-31.

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Latitude, Present Position, INS

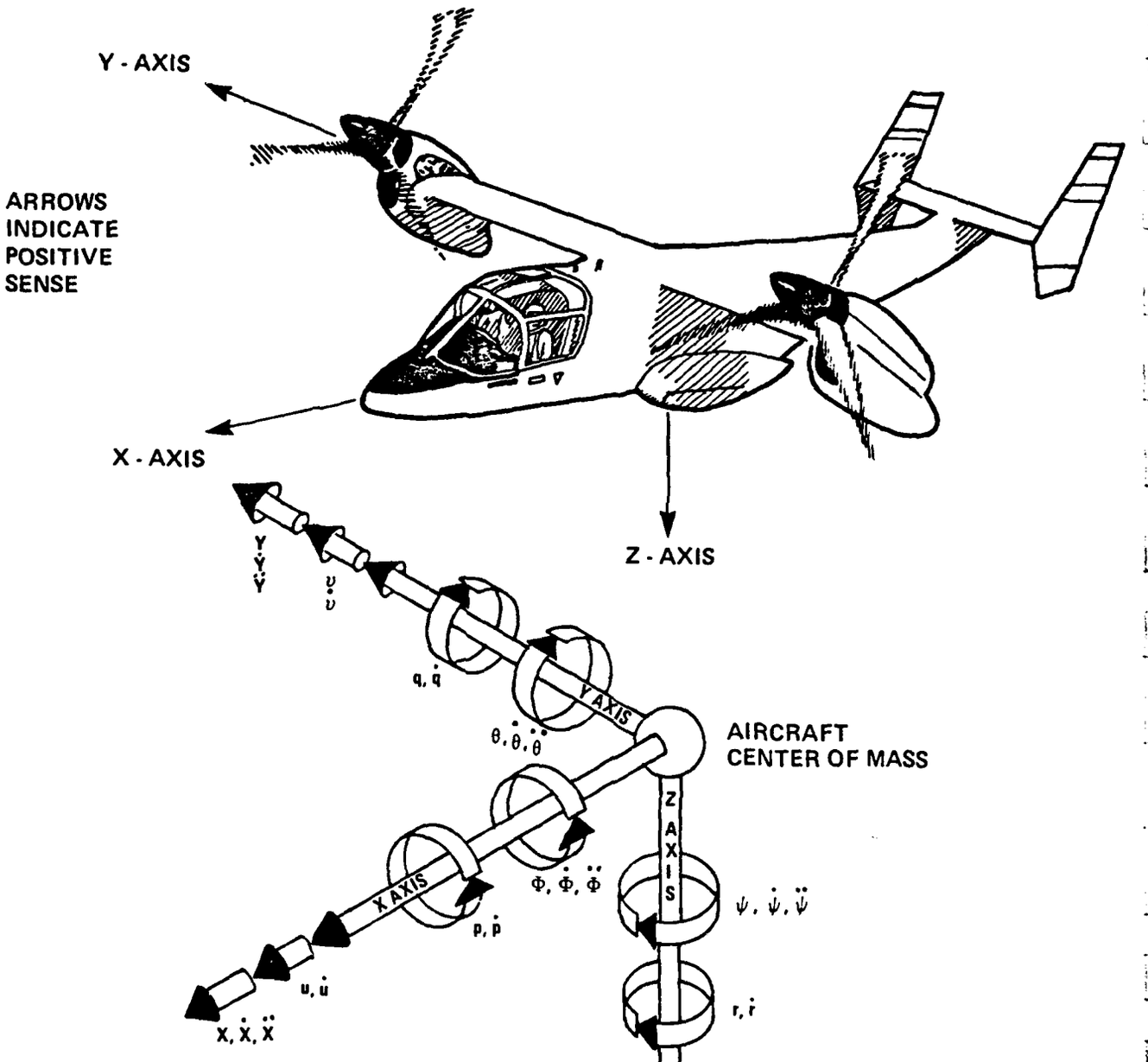
WORD ID	:	INS 03-FCC 12-04/05	MAX VALUE	:	0.5
SOURCE(S)	:	INS	MIN VALUE	:	-0.5
DEST(S)	:	FCC	RESOLUTION	:	0.0000000038
COMP RATE	:	8	ACCURACY	:	0.0000000152
XMIT RATE	:	8	MSB	:	0.5
SIGNAL TYPE	:	2's complement	LSB	:	0.0000000005
UNITS	:	Semicircles	FULLSCALE	:	1

FIELD NAME	BIT NO.	DESCRIPTION
Latitude	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	RESOLUTION : 0.0000000038
	-11-0	
	-12-0	
	-13-0	
	-14-0	
	-15-0 LSB	

REMARKS: Positive Sense: Plus is North
* - Application Dependent

(PAGE)

Figure 11.2-6. Data Word Format for Example Signal



	VELOCITIES	POSITION/ ANGLE	ACCELERA-TION
FORWARD	$\dot{X}, u$	X	$\ddot{X}, \dot{u}$
SIDE	$\dot{Y}, v$	Y	$\ddot{Y}, \dot{v}$
VERTICAL	$\dot{Z}, w$	Z	$\ddot{Z}, \dot{w}$
ROLL	$p, \dot{\Phi}$	Φ	$\dot{p}, \ddot{\Phi}$
PITCH	$q, \dot{\theta}$	θ	$\dot{q}, \ddot{\theta}$
YAW	$r, \dot{\psi}$	ψ	$\dot{r}, \ddot{\psi}$

Figure 11.2-7. Vehicle Fixed-Axis Coordinate System

a. The formal word name (established in paragraph 11.2.4)

b. The engineering units

c. The range (maximum and minimum) of signal value

d. The accuracy required

The following information is used in our example:

WORD NAME: LATITUDE
UNITS: DEGREES
RANGE: ±90 DEGREES (POSITIVE IS NORTH)
ACCURACY: 0.00000273 DEGREES

Refer to the index in Table 11.2-6. We established that the category of our example signal is "angular." The index refers us to Table 11.2-9 for angular category, double precision. Proceed as follows to decide whether data word will be single or double precision:

a. Is RANGE of signal covered by MAX VALUE and MIN VALUE of standard data word format? If not, define data word format for the signal by using the General Rules for Word Construction, paragraph 11.2.2, and the standard data word formats as examples.

   The RANGE of our signal is ±90 DEGREES. We see that the UNITS of the standard data word format are SEMICIRCLES (1 semicircle = 1π radian), so we must convert all signal parameters from DEGREES to SEMICIRCLES. To convert, divide DEGREES by 180. The signal RANGE (±90 DEGREES) becomes ±0.5 SEMICIRCLES, and is within the MAX VALUE (+1) and MIN VALUE (-1) of the standard format.

b. Can the required signal ACCURACY be transmitted using the single precision standard format? If yes, proceed; if no, can double precision standard format accommodate ACCURACY? If yes, proceed; if no, refer to paragraph 11.2.2, General Rules for MIL-STD-1553 Word Construction, and define data word format for the signal using the standard data word formats as examples.

   The example signal's required ACCURACY is 0.00000273 DEGREES, or, after conversion, 0.0000000152 SEMICIRCLES. The LSB value of the first word of the standard format is 2^{-15} (i.e., 0.0000305176) SEMICIRCLES. The format with accuracy of 0.0000305176 cannot accommodate the 0.0000000152 accuracy required. The LSB value of the double precision standard format is 2^{-31} (i.e., 0.000000000466) SEMICIRCLES, which is sufficient to accommodate the 0.0000000152 signal accuracy.

By the preceding steps it was determined that the appropriate standard data word format for the example signal is Table 11.2-9, for angular category, double precision. Now use a blank ICD presentation format sheet (see Tables 11.2-1 and 11.2-2 for single and double precision formats, respectively) as

a worksheet and to document the data word format that will be derived. We need to use the ICD format of Table 11.2-2 because our example data word will be double precision. The completed ICD presentation for our example signal's data word format is shown in Figure 11.2-6. The derivation of each entry which is not application dependent is as follows:

a. DOC. NO.: Application dependent.

b. REV.: Application dependent.

c. DATE: Application dependent.

d. SHEET 1 OF #: 1.

e. WORD NAME: LATITUDE, PRESENT POSITION, INS (formal signal name, selected in paragraph 11.2.4).

f. WORD ID: INS 03-FCC 12-04/05

g. SOURCE(S): INS (source of example signal).

h. DEST(S): FCC (destination of example signal).

i. COMP RATE: 8 Hertz.

j. XMIT RATE: 8 Hertz.

k. SIGNAL TYPE: The encoding format of the digital data is 2's complement notation, as specified in the standard format.

l. UNITS: Semicircles (as specified in standard data word format).

m. MAX VALUE: The maximum value of our signal is +0.5 semicircles (converted from +90 degrees).

n. MIN VALUE: The minimum value of our signal is -0.5 semicircles (converted from -90 degrees).

o. RESOLUTION: 0.0000000038 semicircles (determination of RESOLUTION is application dependent).

p. ACCURACY: 0.0000000152 semicircles (the signal accuracy).

q. MSB: 0.5 semicircles (MSB value as specified in standard data word format).

Note: The MSB value is fixed for each standard data word format; therefore, the maximum transmittable range (MAX VALUE and MIN VALUE) of each data word format is fixed.

r. LSB: 0.0000000005 semicircles (LSB value as specified in standard data word format).

s. FULLSCALE: 1 semicircle (as specified in standard data word format).

t. FIELD NAME: Latitude (application dependent).

u. DESCRIPTION: Application dependent.

v. MSW: This defines the bit assignments for the first data word. This is a signed quantity; therefore, BIT-00 is the sign. BIT-01 is the MSB (MSB of data is transmitted first per MIL-STD-1553B). BIT-02 through BIT-15 are data bits.

w. LSW: This defines the bit assignments for the second data word. BIT-00 through BIT-09 are data bits. BIT-15 is the LSB. BIT-11 through BIT-15 are not used.

x. REMARKS: POSITIVE SENSE: PLUS IS NORTH (statement that data is transmitted as plus equals north latitude).

y. PAGE NO.: Application dependent.

Table 11.2-7. Acceleration Category, Metres/Second/Second, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Acceleration

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 512
SIGNAL TYPE	: 2's complement	LSB	: 0.0000004768
UNITS	: Metres/Second/Second	FULLSCALE	: 1,024

FIELD NAME	BIT NO.	DESCRIPTION
Acceleration	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Notes 1, 2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 0.03125, the designer should use only one word.

Note 2: Coordinate system should be referenced.

Table 11.2-8. Acceleration Category, Feet/Second/Second

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Acceleration

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	512
SIGNAL TYPE	:	2's complement	LSB	:	0.03125
UNITS	:	Feet/Second/Second	FULLSCALE	:	1,024

FIELD NAME	BIT NO.	DESCRIPTION
Acceleration	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	Note 1
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: Coordinate system should be referenced.

Table 11.2-9. Angular Category, Semicircles, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Angle

WORD ID	: *		MAX VALUE	:	*
SOURCE(S)	: *		MIN VALUE	:	*
DEST(S)	: *		RESOLUTION	:	*
COMP RATE	: *		ACCURACY	:	*
XMIT RATE	: *		MSB	:	0.5
SIGNAL TYPE	: 2's complement		LSB	:	0.0000000005
UNITS	: Semicircles		FULLSCALE	:	1

FIELD NAME	BIT NO.	DESCRIPTION
Angle	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Notes 1, 2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: Semicircle = 1 π radian
* - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 0.0000305176, the designer should use only one word.

Note 2: Coordinate system should be referenced.

Table 11.2-10. Angular Acceleration Category, Semicircles/Second/Second

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Angular Acceleration

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	4
SIGNAL TYPE	:	2's complement	LSB	:	0.0001220703
UNITS	:	Semicircles/Second/Second	FULLSCALE	:	8

FIELD NAME	BIT NO.	DESCRIPTION
Angular Acceleration	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	Note 1
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: Semicircle = 1 π radian
* - Application Dependent

Note 1: Coordinate system should be referenced.

Table 11.2-11. Angular Velocity Category, Semicircles/Second, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Angular Velocity

WORD ID	: *		MAX VALUE	: *	
SOURCE(S)	: *		MIN VALUE	: *	
DEST(S)	: *		RESOLUTION	: *	
COMP RATE	: *		ACCURACY	: *	
XMIT RATE	: *		MSB	: 2	
SIGNAL TYPE	: 2's complement		LSB	: 0.0000000018	
UNITS	: Semicircles/Second		FULLSCALE	: 4	

FIELD NAME	BIT NO.	DESCRIPTION
Angular Velocity	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Notes 1, 2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: Semicircle = 1 π radian
* - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 0.0001220703, the designer should use only one word.

Note 2: Coordinate system should be referenced.

Table 11.2-12. ASCII Data Category (Character)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Character

WORD ID	: *	MAX VALUE	: N/A
SOURCE(S)	: *	MIN VALUE	: N/A
DEST(S)	: *	RESOLUTION	: N/A
COMP RATE	: *	ACCURACY	: N/A
XMIT RATE	: *	MSB	: N/A
SIGNAL TYPE	: ASCII	LSB	: N/A
UNITS	: N/A	FULLSCALE	: N/A

FIELD NAME	BIT NO.	DESCRIPTION
Character N	-00-A MSB	
	-01-A	
	-02-A	
	-03-A	Note 1
	-04-A	
	-05-A	
	-06-A	
	-07-A LSB	
Character N + 1	-08-A MSB	
	-09-A	
	-10-A	
	-11-A	Note 1
	-12-A	
	-13-A	
	-14-A	
	-15-A LSB	

REMARKS: * - Application Dependent

Note 1: In standard 7-bit ASCII the first bit of each character field (MSB) shall be set to logic zero (0), and the 7-bit ASCII code shall occupy the remaining seven bits of the field.

Table 11.2-13. BCD Data Category (Channel Select)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME: Channel Select

WORD ID	: *	MAX VALUE	:	N/A
SOURCE(S)	: *	MIN VALUE	:	N/A
DEST(S)	: *	RESOLUTION	:	N/A
COMP RATE	: *	ACCURACY	:	*
XMIT RATE	: *	MSB	:	N/A
SIGNAL TYPE	: NBCD	LSB	:	N/A
UNITS	: N/A	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Channel Select Thousands digit	-00-B MSB	
	-01-B	MAX VALUE = 9
		MIN VALUE = 0
	-02-B	
	-03-B LSB	
Channel Select Hundreds Digit	-04-B MSB	
	-05-B	MAX VALUE = 9
		MIN VALUE = 0
	-06-B	
	-07-B LSB	
Channel Select Tens digit	-08-B MSB	
	-09-B	MAX VALUE = 9
		MIN VALUE = 0
	-10-B	
	-11-B LSB	
Channel Select Ones digit	-12-B MSB	
	-13-B	MAX VALUE = 9
		MIN VALUE = 0
	-14-B	
	-15-B LSB	

REMARKS: * - Application Dependent

Table 11.2-14. Convergence Factor Category

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Convergence Factor

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	1
SIGNAL TYPE	:	Unsigned Numeric	LSB	:	0.0000305176
UNITS	:	N/A	FULLSCALE	:	2

FIELD NAME	BIT NO.	DESCRIPTION
Convergence Factor	-00-N MSB	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-15. Cosine/Sine Category, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Cosine/Sine

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	0.5
SIGNAL TYPE	:	2's complement	LSB	:	0.0000000005
UNITS	:	N/A	FULLSCALE	:	1

FIELD NAME	BIT NO.	DESCRIPTION
Cosine/Sine	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Note 1
		Note 2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent
Note 1: If the resolution requirement for a particular application is coarser than or equal to 0.0000305176, the designer should use only one word.
Note 2: Relevant coordinate system should be referenced.

Table 11.2-16. Counts Category (Signed)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Counts

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	16,384
SIGNAL TYPE	:	2's complement	LSB	:	1
UNITS	:	*	FULLSCALE	:	32,767

FIELD NAME	BIT NO.	DESCRIPTION
Counts	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-17. Counts Category (Unsigned)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Counts

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	32,768
SIGNAL TYPE	:	Unsigned Numeric	LSB	:	1
UNITS	:	*	FULLSCALE	:	65,535

FIELD NAME	BIT NO.	DESCRIPTION
Counts	-00-N MSB	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-18. Data Validity Category (Checksum)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Checksum

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	N/A
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	Unsigned Numeric	LSB	:	N/A
UNITS	:	N/A	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Checksum	-00-N MSB	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	Note 1
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: The checksum word consists of the arithmetic sum, without regard to overflows, of a selected group of data words. More than one checksum word may be used, if required.

Table 11.2-19. Data Validity Category (Error Protection)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 2

WORD NAME : Error Protection

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	N/A
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	Coded (BCH 31,16,3)	LSB	:	N/A
UNITS	:	N/A	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Error Protection Word	-00-C-MSB	
	-01-C	
	-02-C	
	-03-C	
	-04-C	
	-05-C	
	-06-C	
	-07-C	Notes 1,2,3,4
	-08-C	
	-09-C	
	-10-C	
	-11-C	
	-12-C	
	-13-C	
	-14-C LSB	
	-15-0	

REMARKS: * - Application Dependent

Table 11.2-19. Data Validity Category (Error Protection)

DOC. NO. * REV. *
DATE *
SHEET 2 OF 2

WORD NAME : Error Protection

Note 1: Other methods of error protection (dete... available for use. The use of other met... may cause system integration problems. ... tection methods, such as CRC, may be sus... failures or other reliability problems. ... of encoding standards will unnecessar... decoder function. Therefore, the use ... mended for error protection.

Note 2: Number of errors required to be det... dependent.

Note 3: The BCH generating polynomial is:

$$G(X)=X^{15}+X^{11}+X^{10}+X^{9}+X^{7}+X^{5}+X^{4}+X^{2}+X+1$$

where X^{15} indicates the MSB of the 31-bit ... BCH (31,16,3) indicates a 31-bit field, ... and 15 check bits, which provide for err...

Note 4: The Error Protection Word shall immediately ... to be protected. If multiword parameters are ... the Error Protection Word will follow contiguously ... protected data word (e.g., Protected Data Word 1, Error Protection ... Bit Word 1; Protected Data Word 2, Error Protection Word ...

Table 11.2-20. Deviation Category, DDM

DOC. NO. * REV. *
DATE *
SHEET 1 OF 2

WORD NAME : Deviation

WORD ID	:	*	MAX VALUE	:	Note 1
SOURCE(S)	:	*	MIN VALUE	:	Note 1
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	0.5
SIGNAL TYPE	:	2's complement	LSB	:	0.0000305176
UNITS	:	DDM	FULLSCALE	:	1

FIELD NAME	BIT NO.	DESCRIPTION
Deviation	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	Note 2
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: DDM = Difference in Depth of Modulation
* - Application Dependent

Table 11.2-20. Deviation Category, DDM

DOC. NO. * REV. *
DATE *
SHEET 2 OF 2

WORD NAME : Deviation

Note 1: Range for localizer signals is ±0.4 DDM.
Range for glideslope deviation is ±0.8 DDM.

Note 2: Positive values of localizer data indicate a fly-right command.
Positive values of glideslope data indicate a fly-down command.

Table 11.2-21. Distance Category, Metres, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Distance

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	16,384
SIGNAL TYPE	:	2's complement	LSB	:	0.0000152588
UNITS	:	Metres	FULLSCALE	:	32,768

FIELD NAME	BIT NO.	DESCRIPTION
Distance	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Notes 1,2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent
Note 1: If the resolution requirement for a particular application is coarser than or equal to 1, the designer should use only one word.
Note 2: Coordinate system should be referenced.

Table 11.2-22. Distance Category, Feet, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Distance

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 16,777,216
SIGNAL TYPE	: 2's complement	LSB	: 0.015625
UNITS	: Feet	FULLSCALE	: 33,554,432

FIELD NAME	BIT NO.	DESCRIPTION
Distance	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Notes 1,2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 1,024, the designer should use only one word.

Note 2: Coordinate system should be referenced.

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Table 11.2-23. Distance Category, Kilometres, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Distance

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 16,384
SIGNAL TYPE	: 2's complement	LSB	: 0.000015258
UNITS	: Kilometres	FULLSCALE	: 32,768

FIELD NAME	BIT NO.	DESCRIPTION
Distance	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Notes 1,2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 1, the designer should use only one word.

Note 2: Coordinate system should be referenced.

(PAGE)

Table 11.2-24. Distance Category, Nautical Miles (Low Range)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Distance

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 256
SIGNAL TYPE	: 2's complement	LSB	: 0.015625
UNITS	: Nautical Miles	FULLSCALE	: 512

FIELD NAME	BIT NO.	DESCRIPTION
Distance	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-25. Distance Category, Nautical Miles (High Range), Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Distance

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	4,096
SIGNAL TYPE	:	2's complement	LSB	:	0.0000038147
UNITS	:	Nautical Miles	FULLSCALE	:	8,192

FIELD NAME	BIT NO.	DESCRIPTION
Distance	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Note 1
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 0.25, the designer should use only one word.

Table 11.2-26. Flow Category, Kilograms/Hour (Low Range)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Flow

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 32,768
SIGNAL TYPE	: 2's complement	LSB	: 2
UNITS	: Kilograms/Hour	FULLSCALE	: 65,534

FIELD NAME	BIT NO.	DESCRIPTION
Flow	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-27. Flow Category, Kilograms/Minute (High Range)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Flow

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	32,768
SIGNAL TYPE	:	2's complement	LSB	:	2
UNITS	:	Kilograms/Minute	FULLSCALE	:	65,534

FIELD NAME	BIT NO.	DESCRIPTION
Flow	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-28. Frequency Category, Hertz (Four Words)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 4

WORD NAME : Frequency

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	NBCD	LSB	:	N/A
UNITS	:	Hertz	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Frequency (1,000 GHz)	-00-B MSB	
	-01-B	
		LSB = 1 X 10^{12} Hz (1,000 GHz)
	-02-B	
	-03-B LSB	
Frequency (100 GHz)	-04-B MSB	
	-05-B	
		LSB = 1 X 10^{11} Hz (100 GHz)
	-06-B	
	-07-B LSB	
Frequency (10 GHz)	-08-B MSB	
	-09-B	
		LSB = 1 X 10^{10} Hz (10 GHz)
	-10-B	
	-11-B LSB	
Frequency (1 GHz)	-12-B MSB	
	-13-B	
		LSB = 1 X 10^{9} Hz (1 GHz)
	-14-B	
	-15-B LSB	

REMARKS: Four-word quantity--word 1 of 4.
Any contiguous grouping (e.g., 1, 2) can be used to create a frequency data block.
* - Application Dependent

Table 11.2-28. Frequency Category, Hertz (Four Words)

DOC. NO. * REV. *
DATE *
SHEET 2 OF 4

WORD NAME : Frequency

WORD ID	: *	MAX VALUE	: N/A
SOURCE(S)	: *	MIN VALUE	: N/A
DEST(S)	: *	RESOLUTION	: N/A
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: N/A
SIGNAL TYPE	: NBCD	LSB	: N/A
UNITS	: Hertz	FULLSCALE	: N/A

FIELD NAME	BIT NO.	DESCRIPTION
Frequency (100 MHz)	-00-B MSB	
	-01-B	
		LSB = 1 X 10^8 Hz (100 MHz)
	-02-B	
	-03-B LSB	
Frequency (10 MHz)	-04-B MSB	
	-05-B	
		LSB = 1 X 10^7 Hz (10 MHz)
	-06-B	
	-07-B LSB	
Frequency (1 MHz)	-08-B MSB	
	-09-B	
		LSB = 1 X 10^6 Hz (1 MHz)
	-10-B	
	-11-B LSB	
Frequency (100 kHz)	-12-B MSB	
	-13-B	
		LSB = 1 X 10^5 Hz (100 kHz)
	-14-B	
	-15-B LSB	

REMARKS: Four-word quantity--word 2 of 4.
Any contiguous grouping (e.g., 1, 2) can be used to create a frequency data block.
* - Application Dependent

Table 11.2-28. Frequency Category, Hertz (Four Words)

DOC. NO. * REV. *
DATE *
SHEET 3 OF 4

WORD NAME : Frequency

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	NBCD	LSB	:	N/A
UNITS	:	Hertz	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Frequency (10 kHz)	-00-B MSB	
	-01-B	
		LSB = 1 X 10^4 Hz (10 kHz)
	-02-B	
	-03-B LSB	
Frequency (1 kHz)	-04-B MSB	
	-05-B	
		LSB = 1 X 10^3 Hz (1 kHz)
	-06-B	
	-07-B LSB	
Frequency (100 Hz)	-08-B MSB	
	-09-B	
		LSB = 1 X 10^2 Hz (100 Hz)
	-10-B	
	-11-B LSB	
Frequency (10 Hz)	-12-B MSB	
	-13-B	
		LSB = 10 Hz
	-14-B	
	-15-B LSB	

REMARKS: Four-word quantity--word 3 of 4.
Any contiguous grouping (e.g., 1, 2) can be used to create a frequency data block.
* - Application Dependent

Table 11.2-28. Frequency Category, Hertz (Four Words)

DOC. NO. * REV. *
DATE *
SHEET 4 OF 4

WORD NAME : Frequency

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	NBCD	LSB	:	N/A
UNITS	:	Hertz	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Frequency (1 Hz)	-00-B MSB	
	-01-B	
		LSB = 1 Hz
	-02-B	
	-03-B LSB	
Frequency (0.1 Hz)	-04-B MSB	
	-05-B	
		LSB = 1 X 10^{-1} Hz (0.1 Hz)
	-06-B	
	-07-B LSB	
Frequency (0.01 Hz)	-08-B MSB	
	-09-B	
		LSB = 1 X 10^{-2} Hz (0.01 Hz)
	-10-B	
	-11-B LSB	
Frequency (0.001 Hz)	-12-B MSB	
	-13-B	
		LSB = 1 X 10^{-3} Hz (0.001 Hz)
	-14-B	
	-15-B LSB	

REMARKS: Four-word quantity--word 4 of 4.
Any contiguous grouping (e.g., 1, 2) can be used to create a frequency data block.
* - Application Dependent

Table 11.2-29. Frequency Category, Kilohertz (ADF)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : ADF, Low Frequency

WORD ID	: *	MAX VALUE	: N/A
SOURCE(S)	: *	MIN VALUE	: N/A
DEST(S)	: *	RESOLUTION	: N/A
COMP RATE	: *	ACCURACY	: N/A
XMIT RATE	: *	MSB	: N/A
SIGNAL TYPE	: Coded, NBCD	LSB	: N/A
UNITS	: Kilohertz	FULLSCALE	: N/A

FIELD NAME	BIT NO.	DESCRIPTION	
Thousands digit	-00-C MSB	1=2000.0 kHz	
	-01-C LSB	1=1000.0 kHz	
Hundreds digit	-02-B MSB	1= 800.0 kHz	
	-03-B	1= 400.0 kHz	Note 1
	-04-B	1= 200.0 kHz	
	-05-B LSB	1= 100.0 kHz	
Tens digit	-06-B MSB	1= 80.0 kHz	
	-07-B	1= 40.0 kHz	Note 1
	-08-B	1= 20.0 kHz	
	-09-B LSB	1= 10.0 kHz	
Ones digit	-10-B MSB	1= 8.0 kHz	
	-11-B	1= 4.0 kHz	Note 1
	-12-B	1= 2.0 kHz	
	-13-B LSB	1= 1.0 kHz	
Tenths digit	-14-D	1= 0.5 kHz	
	-15-0	Not used	

REMARKS: * - Application Dependent

Note 1: Valid range 0000-1001 (binary).

Table 11.2-30. Frequency Category, Megahertz (VHF/UHF)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : VHF/UHF Frequency

WORD ID	: *	MAX VALUE	: N/A
SOURCE(S)	: *	MIN VALUE	: N/A
DEST(S)	: *	RESOLUTION	: N/A
COMP RATE	: *	ACCURACY	: N/A
XMIT RATE	: *	MSB	: N/A
SIGNAL TYPE	: Coded, NBCD	LSB	: N/A
UNITS	: Megahertz	FULLSCALE	: N/A

FIELD NAME	BIT NO.	DESCRIPTION	
Hundreds digit	-00-C MSB	1 = 200.0 MHz	
	-01-C LSB	1 = 100.0 MHz	
Tens digit	-02-B MSB	1 = 80.0 MHz	
	-03-B	1 = 40.0 MHz	Note 1
	-04-B	1 = 20.0 MHz	
	-05-B LSB	1 = 10.0 MHz	
Ones digit	-06-B MSB	1 = 8.0 MHz	
	-07-B	1 = 4.0 MHz	Note 1
	-08-B	1 = 2.0 MHz	
	-09-B LSB	1 = 1.0 MHz	
Tenths digit	-10-B MSB	1 = 0.8 MHz	
	-11-B	1 = 0.4 MHz	Note 1
	-12-B	1 = 0.2 MHz	
	-13-B LSB	1 = 0.1 MHz	
Hundredths digit	-14-C MSB	1 = 0.050 MHz	
	-15-C LSB	1 = 0.025 MHz	

REMARKS: * - Application Dependent

Note 1: Valid range 0000-1001 (binary).

Table 11.2-31. Mass Category, Kilograms (Low Range)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Mass

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	2,048
SIGNAL TYPE	:	2's complement	LSB	:	0.125
UNITS	:	Kilograms	FULLSCALE	:	4,096

FIELD NAME	BIT NO.	DESCRIPTION
Mass	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-32. Mass Category, Kilograms (High Range)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Mass

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	262,144
SIGNAL TYPE	:	2's complement	LSB	:	16
UNITS	:	Kilogram	FULLSCALE	:	524,272

FIELD NAME	BIT NO.	DESCRIPTION
Mass	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-33. Percent Category

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Percent

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 128
SIGNAL TYPE	: 2's complement	LSB	: 0.0078125
UNITS	: N/A	FULLSCALE	: 256

FIELD NAME	BIT NO.	DESCRIPTION
Percent	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-34. Pressure Category, Kilopascals, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Pressure

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 16,384
SIGNAL TYPE	: 2's complement	LSB	: 0.0000152588
UNITS	: Kilopascals	FULLSCALE	: 32,768

FIELD NAME	BIT NO.	DESCRIPTION
Pressure	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Note 1
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 1, the designer should use only one word.

Table 11.2-35. Pressure Category, Inches of Mercury

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Pressure

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	64
SIGNAL TYPE	:	2's complement	LSB	:	0.00390625
UNITS	:	Inches of Mercury	FULLSCALE	:	128

FIELD NAME	BIT NO.	DESCRIPTION
Pressure	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-36. Ratio Category

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Ratio

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 1
SIGNAL TYPE	: Unsigned Numeric	LSB	: 0.0000305176
UNITS	: N/A	FULLSCALE	: 2

FIELD NAME	BIT NO.	DESCRIPTION
Ratio	-00-N MSB	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-37. Temperature Category, Degrees Celsius

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Temperature

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	1,024
SIGNAL TYPE	:	2's complement	LSB	:	0.0625
UNITS	:	Degrees Celsius	FULLSCALE	:	2,048

FIELD NAME	BIT NO.	DESCRIPTION
Temperature	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-38. Time Category (Three Words)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 3

WORD NAME : Month/Day (Calendar)

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	NBCD	LSB	:	N/A
UNITS	:	N/A	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Month, Tens digit	-00-B MSB	
	-01-B	MAX VALUE = 1
		MIN VALUE = 0
	-02-B	Note 1
	-03-B LSB	
Month, Ones digit	-04-B MSB	
	-05-B	MAX VALUE = 9
		MIN VALUE = 0
	-06-B	Note 1
	-07-B LSB	
Day, Tens digit	-08-B MSB	
	-09-B	MAX VALUE = 3
		MIN VALUE = 0
	-10-B	Note 2
	-11-B LSB	
Day, Ones digit	-12-B MSB	
	-13-B	MAX VALUE = 9
		MIN VALUE = 0
	-14-B	Note 2
	-15-B LSB	

REMARKS: Three-word quantity--word 1 of 3.
Any contiguous grouping (e.g., 1,2) can be used to create a time data block.
* - Application Dependent

Note 1: Valid range 0 - 12 (decimal). 0 = Unused field; 1 = January, etc.

Note 2: Valid range 0 - 31 (decimal). 0 = Unused field.

Table 11.2-38. Time Category (Three Words)

DOC. NO. * REV. *
DATE *
SHEET 2 OF 3

WORD NAME : Hour/Minute

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	NBCD	LSB	:	N/A
UNITS	:	N/A	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Hour, Tens digit	-00-B MSB	
	-01-B	MAX VALUE = 2
		MIN VALUE = 0
	-02-B	Note 3
	-03-B LSB	
Hour, Ones digit	-04-B MSB	
	-05-B	MAX VALUE = 9
		MIN VALUE = 0
	-06-B	Note 3
	-07-B LSB	
Minute, Tens digit	-08-B MSB	
	-09-B	MAX VALUE = 5
		MIN VALUE = 0
	-10-B	Note 4
	-11-B LSB	
Minute, Ones digit	-12-B MSB	
	-13-B	MAX VALUE = 9
		MIN VALUE = 0
	-14-B	Note 4
	-15-B LSB	

REMARKS: Three-word quantity--word 2 of 3.
Any contiguous grouping (e.g., 1,2) can be used to create a time data block.
* - Application Dependent

Note 3: Valid range 0 - 23 (decimal).

Note 4: Valid range 0 - 59 (decimal).

Table 11.2-38. Time Category (Three Words)

DOC. NO. * REV. *
DATE *
SHEET 3 OF 3

WORD NAME : Second

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	NBCD	LSB	:	N/A
UNITS	:	N/A	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
Second, Tens digit	-00-B MSB	
	-01-B	MAX VALUE = 5
		MIN VALUE = 0
	-02-B	Note 5
	-03-B LSB	
Second, Ones digit	-04-B MSB	
	-05-B	MAX VALUE = 9
		MIN VALUE = 0
	-06-B	Note 5
	-07-B LSB	
Second, Tenths digit	-08-B MSB	
	-09-B	MAX VALUE = 9
		MIN VALUE = 0
	-10-B	Note 5
	-11-B LSB	
Second, Hundredths digit	-12-B MSB	
	-13-B	MAX VALUE = 9
		MIN VALUE = 0
	-14-B	Note 5
	-15-B LSB	

REMARKS: Three-word quantity--word 3 of 3.
Any contiguous grouping (e.g., 1,2) can be used to create a time data block.
* - Application Dependent

Note 5: Valid range 0.00 - 59.99 (decimal).

Table 11.2-39. Time Category (Time Tag), Microseconds, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Time Tag

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	2,097,152
SIGNAL TYPE	:	Unsigned Numeric	LSB	:	0.0009766
UNITS	:	Microseconds	FULLSCALE	:	4,194,304

FIELD NAME	BIT NO.	DESCRIPTION
Time Tag	MSW -00-N MSB	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Note 1
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent
Note 1: If the resolution requirement for a particular application is coarser than or equal to 64, the designer should use only one word.

Table 11.2-40. Time Category (Time To), Seconds

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Time To

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 32,768
SIGNAL TYPE	: Unsigned Numeric	LSB	: 1
UNITS	: Seconds	FULLSCALE	: 65,535

FIELD NAME	BIT NO.	DESCRIPTION
Time to Go	-00-N MSB	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-41. Torque Category, Newton-Metres, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Torque

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	16,384
SIGNAL TYPE	:	2's complement	LSB	:	0.0000152588
UNITS	:	Newton-Metres	FULLSCALE	:	32,768

FIELD NAME	BIT NO.	DESCRIPTION
Torque	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Note 1
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 1, the designer should use only one word.

Table 11.2-42. UTM Category (Five Words)

DOC. NO. * REV. *
DATE *
SHEET 1 OF 7

WORD NAME : UTM

WORD ID	: *	MAX VALUE	: N/A
SOURCE(S)	: *	MIN VALUE	: N/A
DEST(S)	: *	RESOLUTION	: N/A
COMP RATE	: *	ACCURACY	: N/A
XMIT RATE	: *	MSB	: N/A
SIGNAL TYPE	: Coded, ASCII	LSB	: N/A
UNITS	: N/A	FULLSCALE	: N/A

FIELD NAME	BIT NO.	DESCRIPTION
Spheroid/Datum	-00-0 MSB	
	-01-C	Most Significant Character Notes 1,3
	-02-C	
	-03-C LSB	
Spheroid/Datum	-04-C MSB	
	-05-C	Least Significant Character Notes 2,3
	-06-C	
	-07-C LSB	
UTM Grid Zone	-08-A MSB	
	-09-A	
	-10-A	
	-11-A	Most Significant Character
	-12-A	
	-13-A	
	-14-A	
	-15-A LSB	

REMARKS: Five-word quantity--word 1 of 5.
* - Application Dependent

Note 1: Hexadecimal values 0 through 7 are valid.
Note 2: Hexadecimal values 0 through F are valid.

Table 11.2-42. UTM Category (Five Words)

WORD NAME : UTM

Note 3:

Spheroid	Hex Code	Datum
International	30	Local Astro
	00	Camp Area Astro
	01	European
	02	Geodetic Datum 1949
	03	Herat North
	04	Hjorsey 1955
	05	Hu-tzu-shan
	06	Maui
	07	Oahu
	08	Kauai
	09	Qornoq
	0A	Provisional South American 1956
	0B	Corrego Alegre
	0C	Campo Inchauspe
	0D	Chua Astro
	0E	Yacare
	0F	Tanerarive Absv. 1925
Clarke 1866	31	Local Astro
	10	Guam 1963
	11	Luzon
	12	CONUS
	13	Alaska and Canada
	14	Luzon Special
Clarke 1880	32	Local Astro
	20	Adindan
	21	Arc 1950
	22	Ghana
	23	Liberia 1964
	24	Merchich
	25	Nigeria
	26	Sierra Leone 1960
	27	Voirol
Everest	33	Local Astro
	3A	Indian
	3B	Timbalai
	3C	Indian Special

Table 11.2-42. UTM Category (Five Words)

WORD NAME : UTM

Note 3 (continued):

Spheroid	Hex Code	Datum
Bessel	34	Local Astro
	40	Bukit Rimpah
	42	Djakarta
	43	G. Segara
	44	G. Serindung
	45	Montjong Lowe
	46	Tokyo
	47	Tokyo Special
Australian National	35	Local Astro
	50	Australian Geodetic
Airy	36	Local Astro
	60	Ordinance Survey of Great Britain 1936
Hough	37	Local Astro
South America	38	Local Astro
Modified Everest	39	Local Astro
	90	Kertau (Malayan Revised Triangulation)
WGS-72	41	Local Astro
	4A	WGS-72 Special

Table 11.2-42. UTM Category (Five Words)

DOC. NO. * REV. *
DATE *
SHEET 4 OF 7

WORD NAME : UTM

WORD ID	:	*	MAX VALUE	:	N/A
SOURCE(S)	:	*	MIN VALUE	:	N/A
DEST(S)	:	*	RESOLUTION	:	N/A
COMP RATE	:	*	ACCURACY	:	N/A
XMIT RATE	:	*	MSB	:	N/A
SIGNAL TYPE	:	ASCII	LSB	:	N/A
UNITS	:	N/A	FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
UTM Grid Zone	-00-A MSB	
	-01-A	
	-02-A	
	-03-A	
	-04-A	
	-05-A	
	-06-A	
	-07-A LSB	
UTM Grid Zone	-08-A MSB	
	-09-A	
	-10-A	
	-11-A	Least Significant Character
	-12-A	
	-13-A	
	-14-A	
	-15-A LSB	

REMARKS: Five-word quantity--word 2 of 5.
* - Application Dependent

Table 11.2-42. UTM Category (Five Words)

DOC. NO. * REV. *
DATE *
SHEET 5 OF 7

WORD NAME : UTM

WORD ID	: *		MAX VALUE	:	N/A
SOURCE(S)	: *		MIN VALUE	:	N/A
DEST(S)	: *		RESOLUTION	:	N/A
COMP RATE	: *		ACCURACY	:	N/A
XMIT RATE	: *		MSB	:	N/A
SIGNAL TYPE	: ASCII		LSB	:	N/A
UNITS	: N/A		FULLSCALE	:	N/A

FIELD NAME	BIT NO.	DESCRIPTION
UTM Area	-00-A MSB	Most Significant Character
	-01-A	
	-02-A	
	-03-A	
	-04-A	
	-05-A	
	-06-A	
	-07-A LSB	
UTM Area	-08-A MSB	Least Significant Character
	-09-A	
	-10-A	
	-11-A	
	-12-A	
	-13-A	
	-14-A	
	-15-A LSB	

REMARKS: Five-word quantity--word 3 of 5.
* - Application Dependent

Table 11.2-42. UTM Category (Five Words)

DOC. NO. REV. *
DATE *
SHEET 6 OF 7

WORD NAME : UTM

WORD ID	: *	MAX VALUE	: 99,998
SOURCE(S)	: *	MIN VALUE	: 0
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 65,536
SIGNAL TYPE	: Unsigned Numeric	LSB	: 2
UNITS	: Metres	FULLSCALE	: 131,070

FIELD NAME	BIT NO.	DESCRIPTION
UTM Easting	-00-N MSB	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: Five-word quantity--word 4 of 5.
* - Application Dependent

Table 11.2-42. UTM Category (Five Words)

DOC. NO. * REV. *
DATE *
SHEET 7 OF 7

WORD NAME : UTM

WORD ID	: *	MAX VALUE	: 99,998
SOURCE(S)	: *	MIN VALUE	: 0
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 65,536
SIGNAL TYPE	: Unsigned Numeric	LSB	: 2
UNITS	: Metres	FULLSCALE	: 131,070

FIELD NAME	BIT NO.	DESCRIPTION
UTM Northing	-00-N MSB	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: Five-word quantity--word 5 of 5.
* - Application Dependent

Table 11.2-43. Velocity Category, Metres/Second, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Velocity

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 4,096
SIGNAL TYPE	: 2's complement	LSB	: 0.0000038147
UNITS	: Metres/Second	FULLSCALE	: 8,192

FIELD NAME	BIT NO.	DESCRIPTION
Velocity	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Notes 1,2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 0.25, the designer should use only one word.

Note 2: Coordinate system should be referenced.

Table 11.2-44. Velocity Category, Feet/Second, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Velocity

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 4,096
SIGNAL TYPE	: 2's complement	LSB	: 0.0000038147
UNITS	: Feet/Second	FULLSCALE	: 8,192

FIELD NAME	BIT NO.	DESCRIPTION
Velocity	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Notes 1,2
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: If the resolution requirement for a particular application is coarser than or equal to 0.25, the designer should use only one word.

Note 2: Coordinate system should be referenced.

Table 11.2-45. Velocity Category, Kilometres/Hour

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Velocity

WORD ID	: *	MAX VALUE	: *
SOURCE(S)	: *	MIN VALUE	: *
DEST(S)	: *	RESOLUTION	: *
COMP RATE	: *	ACCURACY	: *
XMIT RATE	: *	MSB	: 1,024
SIGNAL TYPE	: 2's complement	LSB	: 0.0625
UNITS	: Kilometres/Hour	FULLSCALE	: 2,048

FIELD NAME	BIT NO.	DESCRIPTION
Velocity	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	Note 1
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: Coordinate system should be referenced.

Table 11.2-46. Velocity Category, Knots

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Velocity

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	2,048
SIGNAL TYPE	:	2's complement	LSB	:	0.125
UNITS	:	Knots	FULLSCALE	:	4,096

FIELD NAME	BIT NO.	DESCRIPTION
Velocity	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	Note 1
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Note 1: Coordinate system should be referenced.

Table 11.2-47. Velocity Category, Mach

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Velocity

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	16
SIGNAL TYPE	:	2's complement	LSB	:	0.0009765625
UNITS	:	Mach Number	FULLSCALE	:	32

FIELD NAME	BIT NO.	DESCRIPTION
Velocity	-00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent

Table 11.2-48. Voltage Category, Volts, Double Precision

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Voltage

WORD ID	:	*	MAX VALUE	:	*
SOURCE(S)	:	*	MIN VALUE	:	*
DEST(S)	:	*	RESOLUTION	:	*
COMP RATE	:	*	ACCURACY	:	*
XMIT RATE	:	*	MSB	:	256
SIGNAL TYPE	:	2's complement	LSB	:	0.0000002384
UNITS	:	Volts	FULLSCALE	:	512

FIELD NAME	BIT NO.	DESCRIPTION
Voltage	MSW -00-Sign	
	-01-N MSB	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N	Note 1
	LSW -00-N	
	-01-N	
	-02-N	
	-03-N	
	-04-N	
	-05-N	
	-06-N	
	-07-N	
	-08-N	
	-09-N	
	-10-N	
	-11-N	
	-12-N	
	-13-N	
	-14-N	
	-15-N LSB	

REMARKS: * - Application Dependent
Note 1: If the resolution requirement for a particular application is coarser than or equal to 0.015625, the designer should use only one word.

11.3 MESSAGE FORMATS

Message is defined in MIL-STD-1553B as the transmission of a command word, status word, and data words if they are specified. For the RT-to-RT transmission, the message definition is expanded to include the two command words, the two status words, and the data words. In Chapter 8, page 8-3, of this MUX Handbook, a message is defined to be the data words (1-32) that are part of the information transfer format. The information transfer format is defined the same as the 1553B message definition. For purposes of the discussion to follow, message format is defined to mean the order and content of the data words within the information transfer formats shown in Figures 6 and 7 of MIL-STD-1553B.

The general rules for message construction and standard ICD message formats are included in this section.

11.3.1 Interface Control Document Message Presentation Format

The ICD format required for the documentation of all messages in a 1553 system is shown in Tables 11.3-1 through 11.3-10. Figure 11.3-1 provides the detailed layout for a typical message ICD presentation sheet. Figure 11.3-2 provides an example of a completed message ICD presentation sheet. Presentation formats are provided for the following 1553 transfer types:

a. BC-to-RT Transfer
b. RT-to-BC Transfer
c. RT-to-RT Transfer
d. Mode Command Without Data Word
e. Mode Command With Data Word (Transmit)
f. Mode Command With Data Word (Receive)
g. BC-to-RT Transfer, Broadcast
h. RT-to-RT Transfer, Broadcast
i. Mode Command Without Data Word, Broadcast
j. Mode Command With Data Word, Broadcast

Tables 11.3-1 through 11.3-10 are the skeleton ICD sheets. The definition of each entry is as follows:

DOC. NO.: The interface control document number.

REV.: The revision symbol for this sheet.

DATE: The calendar date of the latest revision to this sheet.

SHEET 1 OF #: This page count allows multiple pages, for extensive REMARKS.

MESSAGE NAME: The formal name selected for this message--A name that is to be used in this and other documents.

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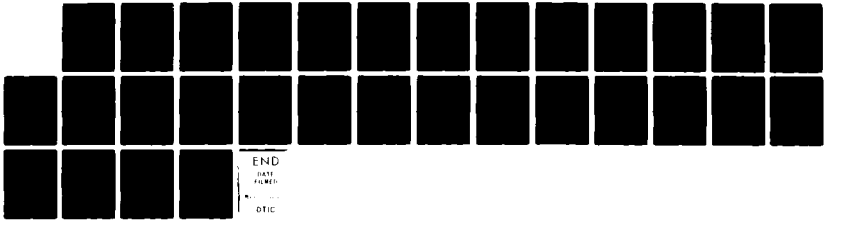
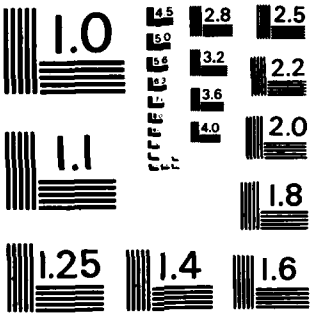
CHAPTER 11(U) SEMCOR INC FARMINGDALE NJ MAR 83
DAAK80-79-C-0258

UNCLASSIFIED F/G 5/2 NL



END
DATE FILMED
DTIC



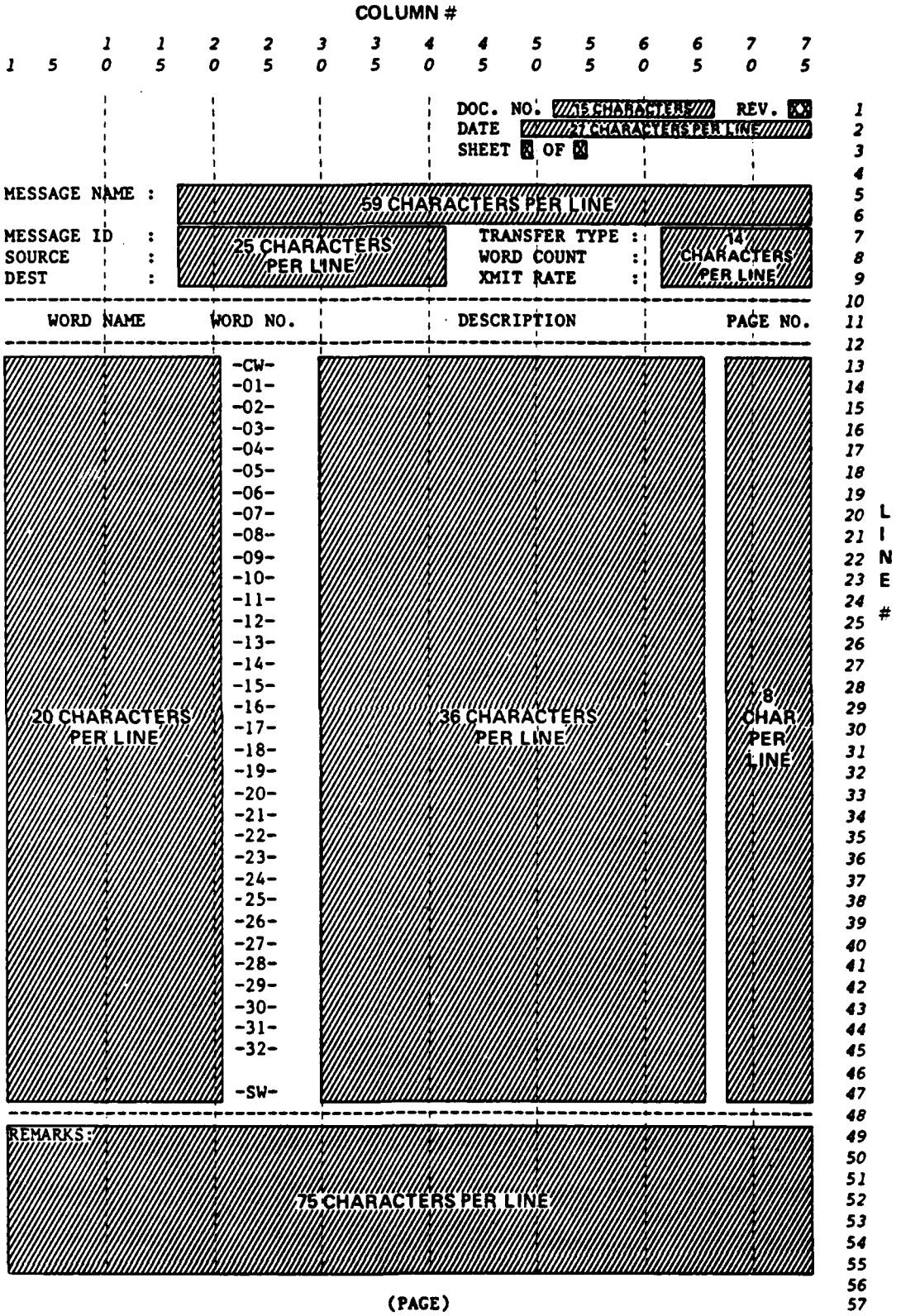


Figure 11.3-1. Message Format ICD Presentation Sheet

MESSAGE NAME : Manual Groundspeed and Track Angle

MESSAGE ID	: HV BC-DNS 22	TRANSFER TYPE	: BC-to-RT
SOURCE	: BC	WORD COUNT	: 2
DEST	: DNS	XMIT RATE	:

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
Receive Command Word	-CW-	To DNS subaddress 22	33
Groundspeed	-01-	HV groundspeed along HV track angle	34
Track Angle	-02-	HV track angle relative to true North	35
Receive Status Word	-SW-	From DNS	36

MESSAGE DESCRIPTION:

Provides for manual entry of groundspeed and track angle in the backup mode of operation. This manual entry replaces remembered velocity in the Doppler computations.

TRANSMISSION CRITERIA:

Transmitted upon operator action in the backup mode of operation.

MESSAGE FUNCTIONAL/STRUCTURAL RELATIONSHIP:

This message shall provide groundspeed and track angle of the vehicle.

The system must be in the backup mode of operation (message HV BC-DNS 16) when this message is transmitted. If the ASN-137 is not in the backup mode of operation upon receipt of message HV BC-DNS 22, the message will be ignored.

NOTE: This function will be negated upon reception of message HV BC-DNS 21.

Figure 11.3-2. Example of a Completed Message ICD Presentation Sheet

MESSAGE ID: Code identifying the message. The MESSAGE ID is a subset of the WORD ID and is constructed as follows:

XXXXSX-YYYYSY
where:

XXXX = Transmitting terminal name (see Table 11.2-3 for examples).

SX = Transmitting terminal 1553 subaddress from which the word originated.

YYYY = Receiving terminal name (see Table 11.2-3 for examples).

SY = Receiving terminal 1553 subaddress to which the word is addressed.

The rules for MESSAGE ID construction are:

Entries in XXXX and YYYY are four characters left-justified with trailing blanks (such as "INSI", "SMS ", "MC "). In the broadcast mode of operation, YYYY is "ALL ".

Entries in SX and SY are two numeric characters with a range of 00-31 or the characters M0 or M1. The latter characters are used in conjunction with the bus controller and the transmission of MIL-STD-1553 mode codes. M0 represents the transmission of 00000 in the subaddress/mode field of the MIL-STD-1553 command word; M1 represents the transmission of 11111 in that field. When M0 and M1 are used as either SX or SY, the numeric entry, used in conjunction with the receive/transmit terminal, will indicate the MIL-STD-1553 mode code (the data word count/mode code field of the MIL-STD-1553 command word). For example, the message ID INS 03-BC1 M0 indicates that a Mode Command Without Data Word, is being commanded by the bus controller (BC1), using 00000 (M0) as the subaddress/mode, to the INS. The mode code being commanded is Initiate Self Test (03).

SOURCE: Name of the subsystem originating the message, usually abbreviated or an acronym. When a message is modified by a subsystem, that subsystem becomes the originating source. Source information is used to allow tracking of data from the originating source to all destinations.

DEST: Name of the subsystem that will receive the message, usually abbreviated or an acronym. Destination information is used to allow tracking of data back to the originating source and to other destinations.

TRANSFER TYPE: BC-to-RT Transfer
RT-to-BC Transfer
RT-to-RT Transfer
Mode Command Without Data Word
Mode Command With Data Word (Transmit)
Mode Command With Data Word (Receive)
BC-to-RT Transfer, Broadcast
RT-to-RT Transfer, Broadcast
Mode Command Without Data Word, Broadcast
Mode Command With Data Word, Broadcast

WORD COUNT: The number of data words transmitted in this message.

XMIT RATE: The rate in times per second (Hz) that the message is transmitted.

WORD NAME: The formal name selected for this word as described in paragraph 11.2.4, Naming.

WORD NO.: Placement of the word within the message.

DESCRIPTION: A functional description of the word.

PAGE NO.: Page location of word presentation format.

REMARKS: Additional comments.

PAGE: Page No. of the ICD.

11.3.2 General Rules for Message Construction

The following is a list of general rules for message construction developed from the message format analysis, common usage, and good engineering practice.

a. Multiple messages from a subsystem containing the same data words should have those data words in the same order.

b. Shorter messages, which contain some of the data words found in a longer message, should be a subset of the longer message with the same data word positions.

c. A header word may be provided as the first word of the message. The header may contain message tag and subsystem mode information, including GO/NO-GO indications.

d. A validity word(s) may be provided to indicate the validity of specific data words within a message. A validity word(s) should be positioned preceding all data words validated.

e. If used, the word sequence within a message should be as follows:

   (1) Header Word

   (2) Validity Word

   (3) Time Tag Word (defined in paragraph 11.2.5)

   (4) Other data words as required.

f. Use standard data words, defined in paragraph 11.2.5.

g. When initially assigning words to messages, leave space for later expansion. In other words, do not assign all 32 word spaces in the beginning. A recommended maximum number of words to be assigned initially is 28.

h. When assigning words to messages, do not program in spare or reserved words.

Table 11.3-1. BC-to-RT Transfer, Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : BC-to-RT Transfer

MESSAGE ID	: *	TRANSFER TYPE	: BC-to-RT
SOURCE	: *	WORD COUNT	: *
DEST	: *	XMIT RATE	: *

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-		
	-01-		
	-02-		
	-03-		
	-04-		
	-05-		
	-06-		
	-07-		
	-08-		
	-09-		
	-10-		
	-11-		
	-12-		
	-13-		
	-14-		
	-15-		
	-16-		
	-17-		
	-18-		
	-19-		
	-20-		
	-21-		
	-22-		
	-23-		
	-24-		
	-25-		
	-26-		
	-27-		
	-28-		
	-29-		
	-30-		
	-31-		
	-32-		
	-SW-		

REMARKS: * - Application Dependent

Table 11.3-2. RT-to-BC Transfer, Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : RT-to-BC Transfer

MESSAGE ID : *
SOURCE : *
DEST : *
TRANSFER TYPE : RT-to-BC
WORD COUNT : *
XMIT RATE : *

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-		
	-SW-		
	-01-		
	-02-		
	-03-		
	-04-		
	-05-		
	-06-		
	-07-		
	-08-		
	-09-		
	-10-		
	-11-		
	-12-		
	-13-		
	-14-		
	-15-		
	-16-		
	-17-		
	-18-		
	-19-		
	-20-		
	-21-		
	-22-		
	-23-		
	-24-		
	-25-		
	-26-		
	-27-		
	-28-		
	-29-		
	-30-		
	-31-		
	-32-		

REMARKS: * - Application Dependent

Table 11.3-3. RT-to-RT Transfer, Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : RT-to-RT Transfer

MESSAGE ID : *
SOURCE : *
DEST : *
TRANSFER TYPE : RT-to-RT
WORD COUNT : *
XMIT RATE : *

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-		
	-CW-		
	-SW-		
	-01-		
	-02-		
	-03-		
	-04-		
	-05-		
	-06-		
	-07-		
	-08-		
	-09-		
	-10-		
	-11-		
	-12-		
	-13-		
	-14-		
	-15-		
	-16-		
	-17-		
	-18-		
	-19-		
	-20-		
	-21-		
	-22-		
	-23-		
	-24-		
	-25-		
	-26-		
	-27-		
	-28-		
	-29-		
	-30-		
	-31-		
	-32-		
	-SW-		

REMARKS: * - Application Dependent

Table 11.3-4. Mode Command Without Data Word, Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : Mode Command Without Data Word

MESSAGE ID	: *		TRANSFER TYPE	:	Mode Command
SOURCE	: *		WORD COUNT	:	*
DEST	: *		XMIT RATE	:	*

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-	Without Data Word	
	-SW-		

REMARKS: * - Application Dependent

Table 11.3-5. Mode Command With Data Word (Transmit), Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : Mode Command With Data Word (Transmit)

MESSAGE ID	: *		TRANSFER TYPE	:	Mode Command
SOURCE	: *		WORD COUNT	:	*
DEST	: *		XMIT RATE	:	*

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-	With Data Word (Transmit)	
	-SW-		
	-01-		

REMARKS: * - Application Dependent

Table 11.3-6. Mode Command With Data Word (Receive), Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : Mode Command With Data Word (Receive)

MESSAGE ID	: *		TRANSFER TYPE	:	Mode Command
SOURCE	: *		WORD COUNT	:	*
DEST	: *		XMIT RATE	:	*

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-	With Data Word (Recei	
	-01-		
	-SW-		

REMARKS: * - Application Dependent

Table 11.3-7. BC-to-RT Transfer, Broadcast, Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : BC-to-RT Transfer, Broadcast

MESSAGE ID : *
SOURCE : *
DEST : *
TRANSFER TYPE : Broadcast
WORD COUNT : *
XMIT RATE : *

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-	BC-to-RT Transfer	
	-01-		
	-02-		
	-03-		
	-04-		
	-05-		
	-06-		
	-07-		
	-08-		
	-09-		
	-10-		
	-11-		
	-12-		
	-13-		
	-14-		
	-15-		
	-16-		
	-17-		
	-18-		
	-19-		
	-20-		
	-21-		
	-22-		
	-23-		
	-24-		
	-25-		
	-26-		
	-27-		
	-28-		
	-29-		
	-30-		
	-31-		
	-32-		

REMARKS: * - Application Dependent

Table 11.3-8. RT-to-RT Transfer, Broadcast, Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : RT-to-RT Transfer, Broadcast

MESSAGE ID	: *	TRANSFER TYPE	: Broadcast
SOURCE	: *	WORD COUNT	: *
DEST	: *	XMIT RATE	: *

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-	RT-to-RT Transfer	
	-CW-		
	-SW-		
	-01-		
	-02-		
	-03-		
	-04-		
	-05-		
	-06-		
	-07-		
	-08-		
	-09-		
	-10-		
	-11-		
	-12-		
	-13-		
	-14-		
	-15-		
	-16-		
	-17-		
	-18-		
	-19-		
	-20-		
	-21-		
	-22-		
	-23-		
	-24-		
	-25-		
	-26-		
	-27-		
	-28-		
	-29-		
	-30-		
	-31-		
	-32-		

REMARKS: * - Application Dependent

Table 11.3-9. Mode Command Without Data Word, Broadcast, Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : Mode Command Without Data Word, Broadcast

MESSAGE ID	: *	TRANSFER TYPE	: Broadcast
SOURCE	: *	WORD COUNT	: *
DEST	: *	XMIT RATE	: *

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW-	Mode Command Without Data Word	

REMARKS: * - Application Dependent

Table 11.3-10. Mode Command With Data Word, Broadcast, Standard Message Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF *

MESSAGE NAME : Mode Command With Data Word, Broadcast

MESSAGE ID	: *	TRANSFER TYPE	: Broadcast
SOURCE	: *	WORD COUNT	: *
DEST	: *	XMIT RATE	: *

WORD NAME	WORD NO.	DESCRIPTION	PAGE NO.
	-CW- -01-	Mode Command With Data Word	

REMARKS: * - Application Dependent

11.3.3 Command and Status Word ICD Presentation Format

Command and status word ICD presentation formats are shown in Tables 11.3-11 through 11.3-20 and Tables 11.3-21 and 11.3-22, respectively. These formats, based on the data word ICD presentation formats of Tables 11.2-1 and 11.2-2, are included to provide consistency and completeness in the ICD process.

A command word ICD presentation format is provided for each MIL-STD-1553 information type:

- BC-to-RT Transfer
- RT-to-BC Transfer
- RT-to-RT Transfer
- Mode Command Without Data Word
- Mode Command With Data Word (Transmit)
- Mode Command With Data Word (Receive)
- BC-to-RT Transfer, Broadcast
- RT-to-RT Transfer, Broadcast
- Mode Command Without Data Word, Broadcast
- Mode Command With Data Word, Broadcast

Two status word presentation formats are provided: Transmit status word and Receive status word. The two formats provide a means of distinguishing uniquely between the two status words in an RT-to-RT transfer through the use of the message ID.

Table 11.3-11. BC-to-RT Transfer, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : BC-to-RT Transfer

WORD ID : ****BC-******-RCW
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	-00-C MSB	Address of receive terminal, * Legal addresses 00000-11110
	-01-C	
	-02-C	
	-03-C	
	-04-C LSB	
T/R	-05-0	0 indicates receive
Subaddress	-06-C MSB	Subaddress of receive terminal, * Legal subaddresses 00001-11110
	-07-C	
	-08-C	
	-09-C	
	-10-C LSB	
Data Word Count	-11-C MSB	Number of words to be received, * Legal range 00000-11111 00000 indicates 32 words
	-12-C	
	-13-C	
	-14-C	
	-15-C LSB	

REMARKS: * - Application Dependent

Table 11.3-12. RT-to-BC Transfer, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : RT-to-BC Transfer

WORD ID : ******-****BC-TCW
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	-00-C MSB	Address of transmit terminal, * Legal addresses 00000-11110
	-01-C	
	-02-C	
	-03-C	
	-04-C LSB	
T/R	-05-1	1 indicates transmit
Subaddress	-06-C MSB	Subaddress of transmit terminal, * Legal subaddresses 00001-11110
	-07-C	
	-08-C	
	-09-C	
	-10-C LSB	
Data Word Count	-11-C MSB	Number of words to be transmitted, * Legal range 00000-11111 00000 indicates 32 words
	-12-C	
	-13-C	
	-14-C	
	-15-C LSB	

REMARKS: * - Application Dependent

Table 11.3-13. RT-to-RT Transfer, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : RT-to-RT Transfer

WORD ID : ******-******-RTCW
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	MSW -00-C MSB	
	-01-C	Address of receive terminal, *
	-02-C	Legal addresses 00000-11110
	-03-C	
	-04-C LSB	
T/R	-05-0	0 indicates receive
Subaddress	-06-C MSB	
	-07-C	Subaddress of receive terminal, *
	-08-C	Legal subaddresses 00001-11110
	-09-C	
	-10-C LSB	
Data Word Count	-11-C MSB	Number of words to be received,
	-12-C	Note 1, *
	-13-C	Legal range 00000-11111
	-14-C	00000 indicates 32 words
	-15-C LSB	
Remote Terminal Address	LSW -00-C MSB	
	-01-C	Address of transmit terminal, *
	-02-C	Legal addresses 00000-11110
	-03-C	
	-04-C LSB	
T/R	-05-1	1 indicates transmit
Subaddress	-06-C MSB	
	-07-C	Subaddress of transmit terminal, *
	-08-C	Legal subaddresses 00001-11110
	-09-C	
	-10-C LSB	
Data Word Count	-11-C MSB	Number of words to be transmitted,
	-12-C	Note 1, *
	-13-C	Legal range 00000-11111
	-14-C	00000 indicates 32 words
	-15-C LSB	

REMARKS: * - Application Dependent

Note 1: Data word count fields must be identical.

Table 11.3-14. Mode Command Without Data Word, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 2

WORD NAME : Mode Command Without Data Word

WORD ID : ******-****M*-MCCW
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	-00-C MSB	Address of transmit terminal, * Legal addresses 00000-11110
	-01-C	
	-02-C	
	-03-C	
	-04-C LSB	
T/R	-05-1	1 indicates transmit
Mode	-06-C MSB	Indicates the contents of the mode code field are to be decoded as a five-bit mode code. Legal values 00000,11111, Note 1
	-07-C	
	-08-C	
	-09-C	
	-10-C LSB	
Mode Code	-11-C MSB	MIL-STD-1553B mode code Legal values, Note 2
	-12-C	
	-13-C	
	-14-C	
	-15-C LSB	

REMARKS: * - Application Dependent

Note 1: Code 00000 should not be used for any system that uses the status word's instrumentation bit (bit 06).

Table 11.3-14. Mode Command Without Data Word,
Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 2 OF 2

WORD NAME : Mode Command Without Data Word

Note 2: 00000 - Dynamic Bus Control
00001 - Synchronize
00010 - Transmit Status Word
00011 - Initiate Self Test
00100 - Transmitter Shutdown
00101 - Override Transmitter Shutdown
00110 - Inhibit Terminal Flag Bit
00111 - Override Inhibit Terminal Flag Bit
01000 - Reset Remote Terminal

Table 11.3-15. Mode Command With Data Word (Transmit), Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Mode Command With Data Word (Transmit)

WORD ID : ******-****M*-MCCDT
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	-00-C MSB	Address of receive terminal, * Legal addresses 00000-11110
	-01-C	
	-02-C	
	-03-C	
	-04-C LSB	
T/R	-05-1	1 indicates transmit
Mode	-06-C MSB	Indicates the contents of the mode code field are to be decoded as a five-bit mode code. Legal values 00000,11111, Note 1
	-07-C	
	-08-C	
	-09-C	
	-10-C LSB	
Mode Code	-11-C MSB	MIL-STD-1553B mode code Legal values, Note 2, *
	-12-C	
	-13-C	
	-14-C	
	-15-C LSB	

REMARKS: * - Application Dependent

Note 1: Code 00000 should not be used for any system that uses the status word's instrumentation bit (bit 06).

Note 2: 10000 - Transmit Vector Word
10010 - Transmit Last Command
10011 - Transmit BIT Word

Table 11.3-16. Mode Command with Data Word (Receive), Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Mode Command with Data Word (Receive)

WORD ID : ****M*-******-MCCDR
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	MSW -00-C MSB	Address of receive terminal, * Legal addresses 00000-11110
	-01-C	
	-02-C	
	-03-C	
	-04-C LSB	
T/R	-05-0	0 indicates receive
Mode	-06-C MSB	Indicates the contents of the mode code field are to be decoded as a five-bit mode code. Legal values 00000, 11111, Note 1
	-07-C	
	-08-C	
	-09-C	
	-10-C LSB	
Mode Code	-11-C MSB	MIL-STD-1553B mode code Legal values, Note 2, *
	-12-C	
	-13-C	
	-14-C	
	-15-C LSB	

REMARKS: * - Application Dependent

Note 1: Code 00000 should not be used for any system that uses the status word's instrumentation bit (bit 06).

Note 2: 10001 - Synchronize
10100 - Selected Transmitter Shutdown
10101 - Override Selected Transmitter Shutdown

Table 11.3-17. BC-to-RT Transfer, Broadcast, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : BC-to-RT Transfer, Broadcast

WORD ID : BC-ALL **-BCCW
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	-00-1 MSB	
	-01-1	
	-02-1	11111 indicates broadcast
	-03-1	
	-04-1 LSB	
T/R	-05-0	0 indicates receive
Subaddress	-06-C MSB	
	-07-C	
	-08-C	Subaddress of receive terminal, * Legal subaddresses 00001-11110
	-09-C	
	-10-C LSB	
Data Word Count	-11-C MSB	
	-12-C	
	-13-C	Number of words to be received, * Legal range 00000-11111 00000 indicates 32 words
	-14-C	
	-15-C LSB	

REMARKS: * - Application Dependent

Table 11.3-18. RT-to-RT Transfer, Broadcast, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : RT-to-RT Transfer, Broadcast

WORD ID : ******-ALL **-BCCRT
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME		BIT NO.	DESCRIPTION
Remote Terminal Address	MSW	-00-1 MSB	11111 indicates broadcast
		-01-1	
		-02-1	
		-03-1	
		-04-1 LSB	
T/R		-05-0	0 indicates receive
Subaddress		-06-C MSB	Subaddress of receive terminals, * Legal subaddresses 00001-11110
		-07-C	
		-08-C	
		-09-C	
		-10-C LSB	
Data Word Count		-11-C MSB	Number of words to be received, Note 1, * Legal range 00000-11111 00000 indicates 32 words
		-12-C	
		-13-C	
		-14-C	
		-15-C LSB	
Remote Terminal Address	LSW	-00-C MSB	Address of transmit terminal, * Legal addresses 00000-11110
		-01-C	
		-02-C	
		-03-C	
		-04-C LSB	
T/R		-05-1	1 indicates transmit
Subaddress		-06-C MSB	Subaddress of transmit terminal, * Legal subaddresses 00001-11110
		-07-C	
		-08-C	
		-09-C	
		-10-C LSB	
Data Word Count		-11-C MSB	Number of words to be transmitted, Note 1, * Legal range 00000-11111 00000 indicates 32 words
		-12-C	
		-13-C	
		-14-C	
		-15-C LSB	

REMARKS: * - Application Dependent

Note 1: Data word count fields must be identical.

Table 11.3-19. Mode Command Without Data Word, Broadcast, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 2

WORD NAME : Mode Command Without Data Word, Broadcast

WORD ID : BC-ALL **-BCMC
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	-00-1 MSB	
	-01-1	
	-02-1	11111 indicates broadcast
	-03-1	
	-04-1 LSB	
T/R	-05-1	1 indicates transmit
Mode	-06-C MSB	
	-07-C	Indicates the contents of the mode code field are to be decoded as a five-bit mode code. Legal values 00000,11111, Note 1
	-08-C	
	-09-C	
	-10-C LSB	
Mode Code	-11-C MSB	
	-12-C	MIL-STD-1553B mode code, * Legal values, Note 2
	-13-C	
	-14-C	
	-15-C LSB	

REMARKS: * - Application Dependent

Note 1: Code 00000 should not be used for any system that uses the status word's instrumentation bit (bit 06).

Table 11.3-19. Mode Command Without Data Word, Broadcast, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 2 OF 2

WORD NAME : Mode Command Without Data Word, Broadcast

Note 2: 00001 - Synchronize
00011 - Initiate Self Test
00100 - Transmitter Shutdown
00101 - Override Transmitter Shutdown
00110 - Inhibit Terminal Flag Bit
00111 - Override Inhibit Terminal Flag Bit
01000 - Reset Remote Terminal

Table 11.3-20. Mode Command With Data Word, Broadcast, Standard Command Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 2

WORD NAME : Mode Command With Data Word, Broadcast

WORD ID : BC-ALL **-BCMCD
XMIT RATE : *
SIGNAL TYPE : Command Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	MSW -00-1 MSB	
	-01-1	
	-02-1	11111 indicates broadcast
	-03-1	
	-04-1 LSB	
T/R	-05-0	0 indicates receive
Mode	-06-C MSB	
	-07-C	Indicates the contents of the mode code field are to be decoded as a five-bit mode code. Legal values 00000,11111, Note 1
	-08-C	
	-09-C	
	-10-C LSB	
Mode Code	-11-C MSB	
	-12-C	MIL-STD-1553B mode code, * Legal values, Note 2
	-13-C	
	-14-C	
	-15-C LSB	

REMARKS: * - Application Dependent

Note 1: Code 00000 should not be used for any system that uses the status word's instrumentation bit (bit 06).

Note 2: 10001 - Synchronize
10100 - Selected Transmitter Shutdown
10101 - Override Selected Transmitter Shutdown

Table 11.3-21. Receive, Standard Status Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Status Word, Receive

WORD ID : ******-******-RSW
XMIT RATE : *
SIGNAL TYPE : Status Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	-00-C MSB	Address of receive terminal, * Legal addresses 00000-11111 11111 indicates broadcast
	-01-C	
	-02-C	
	-03-C	
	-04-C LSB	
Message Error	-05-D	1 indicates message error, Note 1
Instrumentation	-06-0	Always set to zero
Service Request	-07-D	1 indicates service requested, Note 1
Reserved	-08-0 MSB	Always set to 000
	-09-0	
	-10-0 LSB	
Broadcast Command Received	-11-D	1 indicates preceding valid command word was a broadcast command, Note 1
Busy	-12-D	1 indicates subsystem is busy, Note 1
Subsystem Flag	-13-D	1 indicates a subsystem fault condition, Note 1
Dynamic Bus Cont. Acceptance	-14-D	1 indicates acceptance of control, Note 1
Terminal Flag	-15-D	1 indicates a terminal fault condition, Note 1

REMARKS: * - Application Dependent

Note 1: Set to zero if not implemented.

Table 11.3-22. Transmit, Standard Status Word Format

DOC. NO. * REV. *
DATE *
SHEET 1 OF 1

WORD NAME : Status Word, Transmit

WORD ID : ******-******-TSW
XMIT RATE : *
SIGNAL TYPE : Status Word

FIELD NAME	BIT NO.	DESCRIPTION
Remote Terminal Address	-00-C MSB	
	-01-C	Address of transmit terminal, *
	-02-C	Legal addresses 00000-11111
	-03-C	11111 indicates broadcast
	-04-C LSB	
Message Error	-05-D	1 indicates message error, Note 1
Instrumentation	-06-0	Always set to zero
Service Request	-07-D	1 indicates service requested, Note 1
Reserved	-08-0 MSB	
	-09-0	Always set to 000
	-10-0 LSB	
Broadcast Command Received	-11-D	1 indicates preceding valid command word was a broadcast command, Note 1
Busy	-12-D	1 indicates subsystem is busy, Note 1
Subsystem Flag	-13-D	1 indicates a subsystem fault condition, Note 1
Dynamic Bus Cont. Acceptance	-14-D	1 indicates acceptance of control, Note 1
Terminal Flag	-15-D	1 indicates a terminal fault condition, Note 1

REMARKS: * - Application Dependent

Note 1: Set to zero if not implemented.